TANDBERG DATA

Securing your Information

SCSI Reference

Magnum 224, Magnum 448
StorageLibrary T24, or StorageLoader 2U LTO

Part Number 1014826 Rev. E - June 2007

www.tandbergdata.com

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PART NUMBER

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REVISION HISTORY

Revision	Date	Description
A	April 2006	Initial release.
B	July 2006	Add Magnum 448 and Fibre Channel information.
C	August 2006	Added Error Codes appendix
D	February 2007	Removed references to taking a “dump” over SCSI
E	June 2007	Added StorageLibrary T24 and StorageLoader 2U LTO, converted from Exabyte to Tandberg Data.

NOTE: The most current information about this product is available at Tandberg Data’s web site (www.tandbergdata.com).

PRODUCT WARRANTY CAUTION

The Magnum 224, Magnum 448, StorageLibrary T24, or StorageLoader 2U LTO library by Tandberg Data Corporation is warranted to be free from defects in materials, parts, and workmanship and will conform to the current product specification upon delivery. For the specific details of your warranty, refer to your sales contract or contact the company from which the library was purchased.

The warranty for the library shall not apply to failures caused by:

- Physical abuse or use not consistent with the operating instructions or product specifications.
- Repair or modification by any one other than Tandberg Data’s personnel or agent in a manner differing from the maintenance instructions provided by Tandberg Data.
- Removal of the Tandberg Data identification label(s).
- Physical abuse due to improper packaging of returned library.

If problems with the library occur, contact your maintenance organization; do not void the product warranty by allowing untrained or unauthorized personnel to attempt repairs.

Caution Returning the library in unauthorized packaging may damage the unit and void the warranty. If you are returning the library for repair, package it in its original packaging (or in replacement packaging obtained from your vendor.)

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ABOUT THIS MANUAL

This manual provides reference information for developing SCSI applications for the Magnum 224, StorageLibrary T24, StorageLoader 2U LTO Library, or the Magnum 448 LTO Library (referred to as the *library*). Note that SCSI operations performed by the library are separate from the SCSI operations performed by the enclosed tape drive. For tape drive SCSI operations, refer to the tape drive documentation.

Information that is specific to the individual libraries is indicated as follows:

Magnum 224, StorageLibrary T24, or StorageLoader 2U LTO Library (Magnum 224, T24, or SL 2U)—Slot count, Inquiry, Mode Select, and so forth.

Magnum 448 Library—Slot count, Inquiry, Mode Select, and so forth.

> PRELIMINARY – This manual may contain some preliminary information that may change without notice.

CONTENTS OF THIS MANUAL

This manual contains the following information:

- Chapter 1 provides a general overview of the library.
- Chapter 2 contains information about how the library operates as a device in a SCSI environment, including an overview of the control modes and common SCSI operations. This chapter also describes the elements in the library, the SCSI command set, and common SCSI operations.
- Chapter 3 contains information about using SCSI commands to configure the library and implementing common SCSI operations. This chapter also describes how the library tracks data cartridges.
- Chapter 4 through Chapter 25 contain information about individual SCSI commands. For ease of reference, the commands are listed in alphabetical order.

RELATED PUBLICATIONS

For additional information about the library and tape drive, refer to the following publications.

Magnum 224, T24, SL 2U Library, and Magnum 448 LTO Library

- *Magnum 224, StorageLibrary T24, or StorageLoader 2U LTO Library Product Manual,* 1017472
- *Magnum 448 LTO Library Product Manual,* 1014832
- *Magnum 224, StorageLibrary T24, or StorageLoader 2U LTO Library LTO Library Quick Start Guide*, 1017473
- *Magnum 448 LTO Library Quick Start Guide*, 1014836

- *Installing a Library into a Rack or replacing a Magazine (Magnum 224, Magnum 448, StorageLibrary T24, or StorageLoader 2U LTO Library)*, 1017475
- *Replacing the Tape Drive in the Magnum 224, StorageLibrary T24, or StorageLoader 2U LTO Library*, 1017476
- *Tandberg Data Bar Code Label Specification for LTO Ultrium Cartridges*, 1004080-000

Ultrium Tape Drives

See the following web sites to locate documentation and support information for LTO Ultrium tape drives:

- IBM — www.storage.ibm.com/tape/lto/oem/index.html
- Hewlett Packard — www1.hp.com/storage/tapestorage.html

Standards

- *Small Computer System Interface - 2 (SCSI-2)*, INCITS 131-1994[R2004]
- *SCSI Primary Commands-2 (SPC-2)*, INCITS 351-2001
- *SCSI-3 Primary Commands (SPC)*, INCITS 301-1997 [R2002]
- *SCSI-3 Medium Changer Commands (SMC)*, INCITS 314-1998 [R2003]
- *SCSI Parallel Interface-4 (SPI-4)*, INCITS 362-2002
- *TapeAlert Specification*, NCITS T10/02-142R0, Version 3.0, March 2002
- IEC 60297 Rack Standards
- *Automation/Drive Interface - Commands (ADC)*, Working Draft, Revision 7, September 14, 2004
- *Automation/Drive Interface - Transport Protocol (ADT)*, Working Draft, Revision 14, November 18, 2004
- *SCSI Media Changer Commands - 2 (SMC-2)*, Working Draft, Revision 7, November 18, 2003

CONVENTIONS USED IN THIS MANUAL

This manual uses the following conventions:

Note: Notes provide additional information or suggestions about the topic or procedure being discussed.

! Important Read text marked by the "Important" icon for information that will help you complete a procedure or avoid extra steps.

Caution Read text marked by the "CAUTION" icon for information you must know to avoid damaging the library, the tape drive, or losing data.

1 PRODUCT OVERVIEW

This chapter provides an overview of the physical properties and features of the library, including the following:

- Features
- Control modes
- Emulation modes

1.1 FEATURES

1.1.1 FRONT PANEL COMPONENTS

Magnum 224, T24, SL 2U—Figure 1-1 shows the library's front panel components. For a detailed description of these components, refer to the *Magnum 224, StorageLibrary T24, or StorageLoader 2U LTO Library Product Manual.*

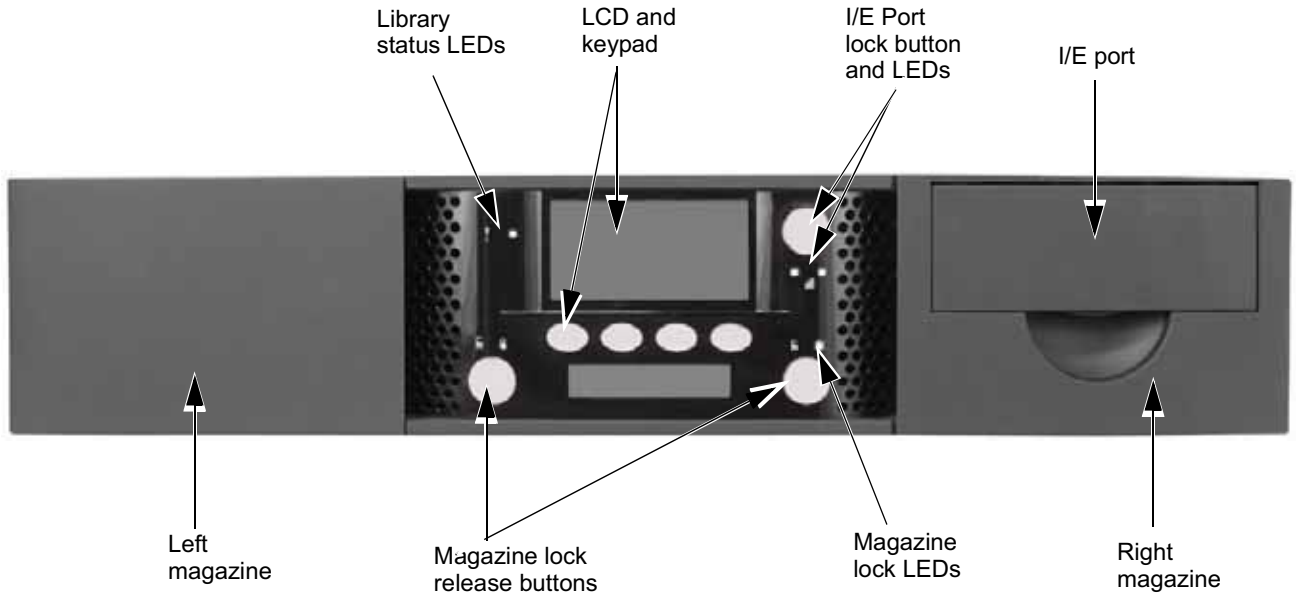


Figure 1-1 *Front panel components (Magnum 224, T24, SL 2U)*

Magnum 448—Figure 1-2 shows the library's front panel components. For a detailed description of these components, refer to the *Magnum 448 LTO Library Product Manual*.

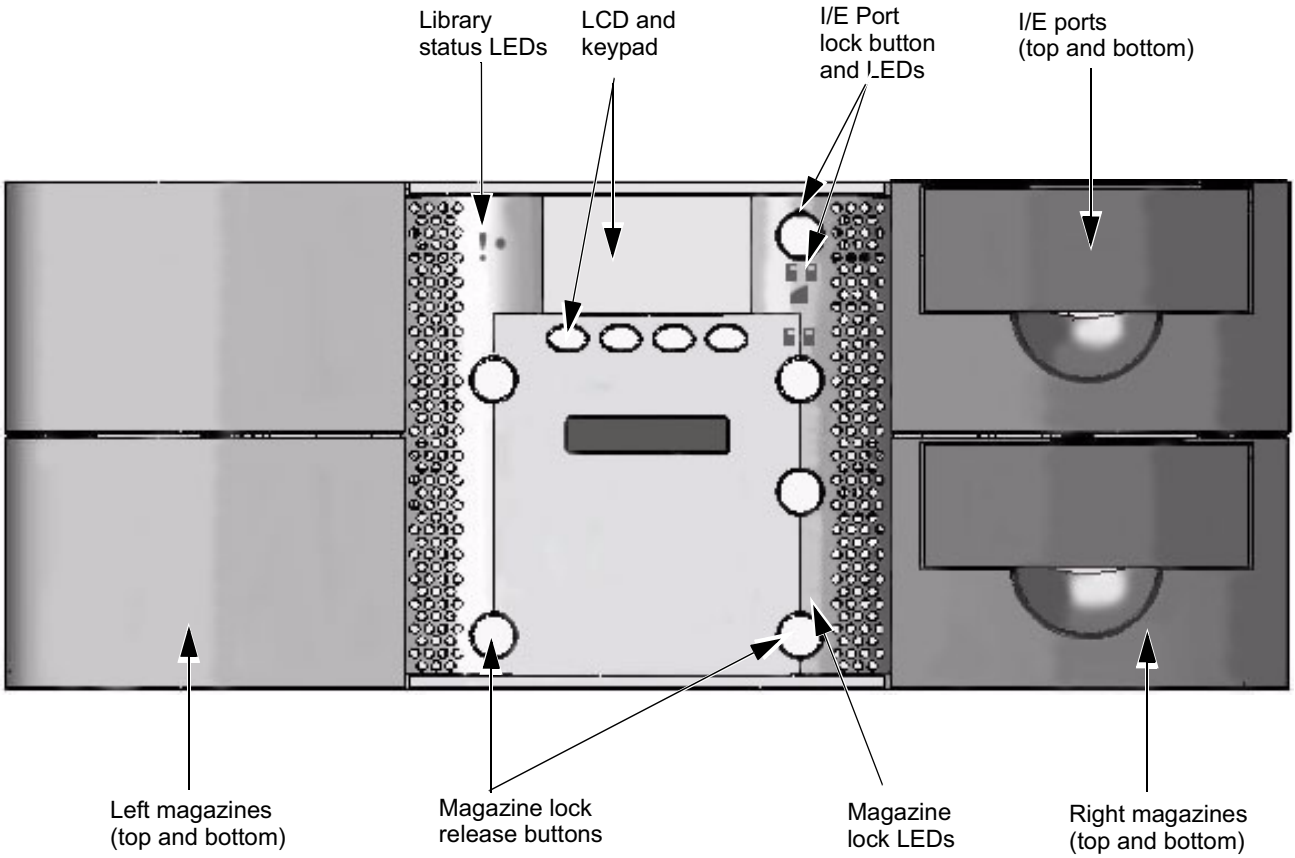

Library status LEDs
LCD and keypad
I/E Port lock button and LEDs
I/E ports (top and bottom)
Left magazines (top and bottom)
Magazine lock release buttons
Magazine lock LEDs
Right magazines (top and bottom)

Figure 1-2 *Front panel components (Magnum 448)*

1.1.2 BACK PANEL COMPONENTS

Magnum 224, T24, SL 2U Library—Figure 1-3 shows the back panel components of the library.

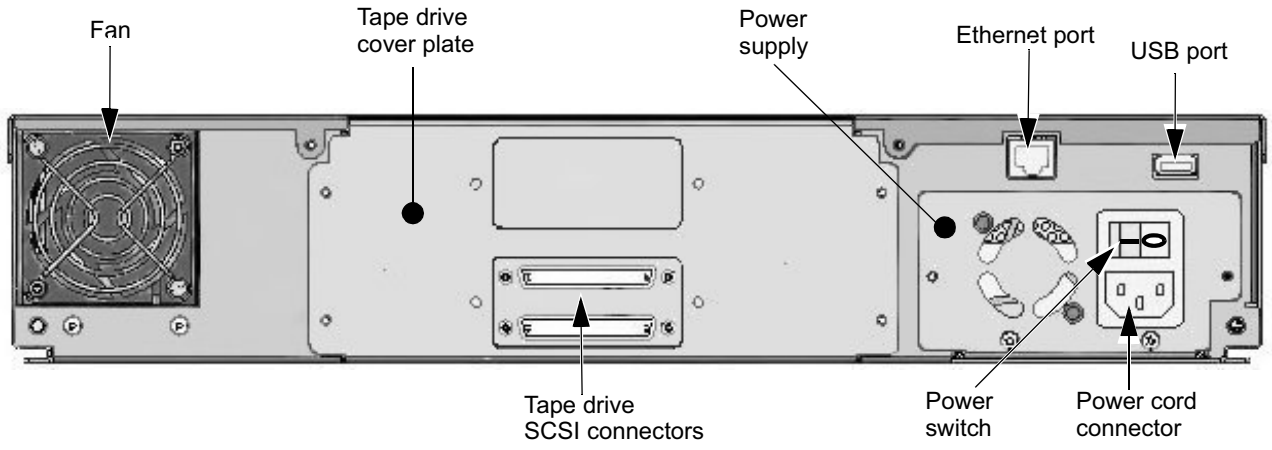


Figure 1-3 *Back panel components (Magnum 224, T24, SL 2U library)*

Magnum 448—Figure 1-4 shows the back panel components of the Magnum 448 library.

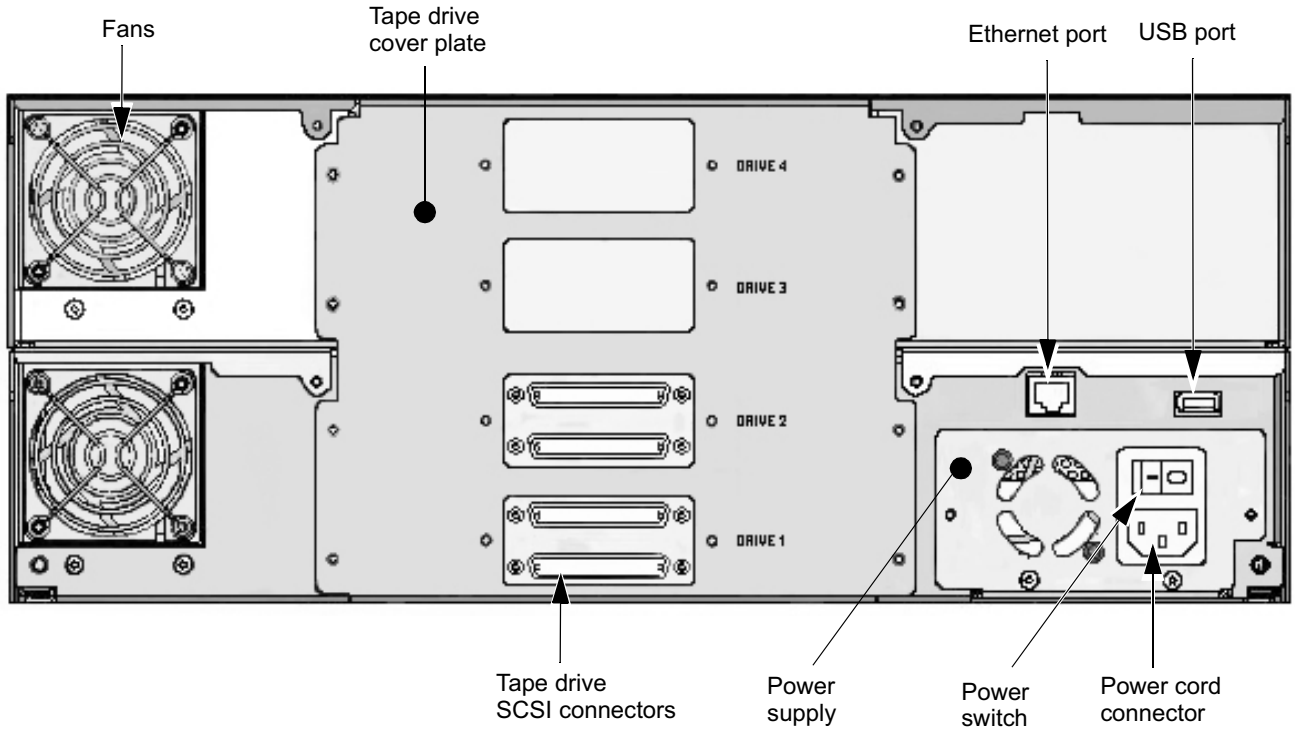


Figure 1-4 *Back panel components (Magnum 448 SCSI library)*

The library includes the following features:

- **Storage for data cartridges.**

  Magnum 224 or StorageLibrary T24—Storage for up to 24 data cartridges are stored in the library. The magazines hold up to 12 cartridges each.

  StorageLoader 2U LTO—Storage for up to 20 data cartridges are stored in the library. The magazines hold up to 10 cartridges each.

  Magnum 448—Storage for up to 48 data cartridges are stored in the library. The magazines hold up to 12 cartridges each.

  Note: The left magazines are optional. The library ships with the right magazine (or magazines) installed and a "blank" (or blanks) installed in the left magazine's location.

- **Tape drives.** The library contains high-performance, high-capacity LTO tape drives in one of these options:

  Magnum 224, T24, or SL 2U—

  - One full height LTO Ultrium 4 tape drive
  - One full height LTO Ultrium 3 tape drive
  - One or two half height LTO Ultrium 2 tape drive(s)

  Magnum 448—

  - One or two full height LTO Ultrium 3 tape drives
  - One, two, three, or four half height LTO Ultrium 2 tape drive(s)

- **Import/Export Port (I/E Port).** The I/E port allows you to insert and remove cartridges without opening the library's door and interrupting operation.

- **Bar code scanner.** A bar code scanner allows the library to maintain an inventory of its cartridges.

- **Operator panel with LCD display.** The operator panel allows you to monitor library operations and select configuration options.

- **Interface options.** Depending on the tape drive(s) installed in your library, you will have one of these options.

  - **Wide, low-voltage differential (LVD) SCSI—**The LVD tape drives support independent sets of SCSI messages and commands and can be connected to separate LVD SCSI busses.

  - **Fibre Channel—**The Fibre Channel interface allows you to connect the library to a Fibre Channel network.

  Note: For both the LVD SCSI and Fibre Channel tape drives: the library communicates with the host through the SCSI interface of the tape drive(s) via the ADI serial interface. The SCSI interface as seen by the host is the SCSI interface of the tape drive
  See the tape drive's Product Manual for tape drive information.
  IBM — www.storage.ibm.com/tape/lto/oem/index.html
  Hewlett Packard — www1.hp.com/storage/tapestorage.html
  See Automation/Drive Interface - Command (ADC) for ADI information.

- **Ethernet port for connection to a 10/100BaseT Ethernet network.** When used with the Remote Management utility, you can connect the library to an Ethernet network for remote monitoring, upgrading library firmware, and creating diagnostic listings.

- **Remote Management Utility.** The library's Remote Management utility allows you to use a standard web browser to set configuration options, view library information, and monitor library operations over an Ethernet network.

- **Universal Serial Bus Connector**. The library is equipped with a Universal Serial Bus connector for running diagnostics or upgrading firmware.
- **Rack-mount hardware.** The library is designed to mount in a standard 19-inch rack using:
  - **Magnum 224, T24, SL 2U**—2 units (2U) of rack space
  - **Magnum 448**—4 units (4U) of rack space

  Rack-mounting hardware is included with the library.

1.2 CONTROL MODES

Note: You can issue commands to the library in any of the control modes. However, the library must be in Random mode if you want to control it through an application.

The operating mode determines how the library processes cartridges. The library will operate using one of these two options.

- Random–The library processes cartridges according to commands issued from an application using the SCSI command set.
- Sequential–The library processes cartridges sequentially without direction from an application.

  In Sequential mode, magazines are automatically associated with tape drives so that each tape drive and its associated magazine (or magazines) becomes an independent autoloader.

Random is the default operating mode for the library. See the *Magnum 224, StorageLibrary T24, or StorageLoader 2U LTO Library Product Manual* or the *Magnum 448 Library Product Manual* for instructions on setting Sequential mode.

! Important If you are using a backup application which is capable of controlling the library, do *not* configure the library to operate in Sequential mode.

When the device is in Sequential Mode, all SCSI commands that require the library to be READY will get a CHECK CONDITION, NOT READY, with ASC/ASCQ of 04/8E (Not Ready Sequential Mode) and an FSC of 0x2B (In Sequential Mode).

1.3 EMULATION MODES

Emulation allows the library to be controlled by most, but not all, SCSI drivers developed for the device being emulated.

1.3.1 MAGNUM 224, T24, OR SL 2U EMULATION MODES

Table 1-1 lists the INQUIRY command Product Identification string returned by the library for each emulation mode setting. See page 6-6 for more information about the Product Identification string.

Table 1-1 *Magnum 224, T24, or SL 2U emulation mode Product Identification string*

When you select this emulation mode...	The library returns this Product Identification string in response to an INQUIRY command...
Native	The Product Identification stored in the library's microcode. The default is "MAGNUM 224_ _ _ _ _ " where each "_" represents an ASCII space character.
Exabyte 221L	"Exabyte 221L_ _ _ _" where each "_" represents an ASCII space character.
EZ17 library	"Exabyte EZ17_ _ _ _" where each "_" represents an ASCII space character.
210 Emulation	"EXB-210_ _ _ _ _ _ _ _ _" where each "_" represents an ASCII space character.

1.3.2 MAGNUM 448 EMULATION MODES

Table 1-2 lists the INQUIRY command Product Identification string returned by the library for each emulation mode setting. See page 6-6 for more information about the Product Identification string.

Table 1-2 *Magnum 448 emulation mode Product Identification string*

When you select this emulation mode...	The library returns this Product Identification string in response to an INQUIRY command...
Native	The Product Identification stored in the library's microcode. The default is "MAGNUM 448_ _ _ _ _ " where each "_" represents an ASCII space character.
Exabyte 221L	"Exabyte 221L_ _ _ _" where each "_" represents an ASCII space character.
EZ17 library	"Exabyte EZ17_ _ _ _" where each "_" represents an ASCII space character.
210 Emulation	"EXB-210_ _ _ _ _ _ _ _ _" where each "_" represents an ASCII space character.

2

OVERVIEW OF THE LIBRARY AS A SCSI DEVICE

This chapter provides background information for understanding how the library operates as a device on a SCSI bus.

Note: The library communicates with the host through the SCSI interface of the tape drive via the ADI serial interface. The SCSI interface as seen by the host is the SCSI interface of the tape drive.

See the tape drive *Product Manual* for tape drive information.

See the *Automation/Drive Interface - Commands (ADC)* for ADI information.

This chapter provides an overview of the following:

- The library's relationship to the SCSI bus
- The elements and element addresses of the library
- SCSI command protocol

2.1 RELATIONSHIP TO THE SCSI BUS

The Small Computer System Interface (SCSI) is a standard that enables a host computer and peripheral equipment, such as the tape drive, to communicate. The library does not have a SCSI controller, but rather, communicates with the host using ADI bridging through the tape drive(s).

Using the ADI interface, the:

- Library–gets information from the tape drive and commands some tape drive actions, such as Load and Unload.
- Tape drive–acts as intermediary for the host and the library SCSI communications.

Because host / library SCSI communication is routed through the tape drive, the library appears on the SCSI bus as LUN 1 of the tape drive.

The physical components of the SCSI system consist of the following:

- **Initiator (host).** A computer equipped with either a SCSI bus adapter card, or Fibre Channel host bus adapter or switch, which allows it to send commands, messages, and data across the bus to targets such as the tape drive. The initiator can also receive data, messages, and status from the targets.
- **Targets.** Devices capable of receiving commands from an initiator. The library and its internal tape drive(s) are independent targets. The library is the target for cartridge inventory and movement operations. The tape drives are the target for read and write operations.
- **SCSI or FC interface.** The library may use parallel SCSI bus communication or a serial Fibre Channel communication interface. The communication interface is the physical connection between the host and the target.
  - **SCSI bus—**The SCSI cables that connect the SCSI bus adapter card to the tape drive and other devices form the SCSI bus and provide a pathway for passing information between the initiator and the targets. The tape drives use a wide, low-voltage differential (LVD) SCSI configuration. The SCSI bus attached to the tape drive(s) installed in the library must be terminated at both ends.

    Each device attached to a SCSI bus has a unique SCSI ID that identifies it during communication. In wide SCSI configurations, up to 16 devices (including one or more initiators) can be attached to each SCSI bus. SCSI IDs can range from 0 to 15 for each bus.

! Important Although single-ended SCSI is compatible with Ultra-2 and Ultra-3 SCSI, Tandberg Data does not support single-ended devices on the SCSI bus used by the library.

Attaching an HVD device to an LVD SCSI bus may cause the SCSI bus to hang.

  - **Fibre Channel—**The serial Fibre Channel communication interface uses pairs of optical fibers to connect the library to host bus adapters or to Fibre Channel switches.

Note: The library communicates with the host through the SCSI interface of the tape drive(s) via the ADI serial interface. The SCSI interface as seen by the host is the SCSI interface of the tape drive
See the tape drive *Product Manual* for tape drive information.
See *Automation/Drive Interface - Command (ADC)* for ADI information.

- **Elements and Element Addresses**. Elements are the locations in the library that can accept a cartridge.

2.1.1 ELEMENT TYPES

The Magnum 224, Magnum 448, StorageLibrary T24, or StorageLoader 2U LTO includes four types of elements:

Element	Description
Medium transport	The cartridge handling mechanism (robot) is the medium transport element. This mechanism moves the cartridges between the tape drive(s) and the storage cells.
Storage (slots/cells)[a]	▪ Magnum 224 or T24—24 storage elements ▪ SL 2U—20 storage elements ▪ Magnum 448—48 storage elements
Data transfer	A tape drive is a data transfer element that reads and writes data as requested by the host. ▪ Magnum 224, T24, or SL 2U—one or two data transfer elements ▪ Magnum 448—one, two, three, or four data transfer elements
Import/Export[a]	▪ Magnum 224, T24, or SL 2U—one I/E port element ▪ Magnum 448—two I/E port elements

[a] The storage slots/cells increase or decrease based on the I/E Ports setting (enabled or disabled). Disabling the I/E Ports increase the storage slot/cell count. You can also assign slot/cell 2 as a "fixed" cleaning slot (see the *Magnum 224, StorageLibrary T24, or StorageLoader 2U LTO Library Product Manual* or the *Magnum 448 LTO Library Product Manual*).

The library maintains current information about each element in its cartridge inventory, which is stored in memory.

2.1.2 ELEMENT ADDRESSES

Each of the elements in the library requires an address so it can be identified by SCSI commands. Figure 2-1, Figure 2-2, Figure 2-3, Figure 2-4, Figure 2-5, Figure 2-6, and Figure 2-7, shows the default addresses assigned to each element in the library.

Note: The default element addresses are identical to the element indexes. The library uses element indexes to identify the library elements when performing diagnostic operations from the operator panel.

You can use the MODE SELECT command to change the address of each element in the library, as described in Chapter 9, "MODE SELECT (15h).

Magnum 224, T24, or SL 2U Element Addresses

The following illustrations show the Magnum 224, T24, or SL 2U element address with two different configurations.

- **I/E Port enabled/No fixed cleaning slot (Magnum 224 or StorageLibrary T24)**—This figure shows the element addresses for this configuration.

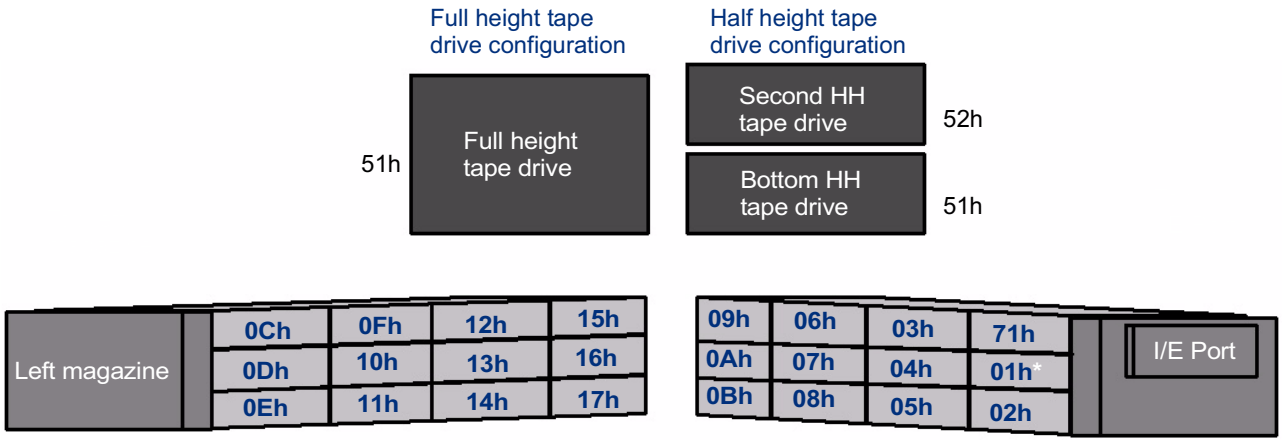


Figure 2-1 *Mag 224/T24 element addresses (I/E port enabled/no fixed cleaning slot)*

Note: If the fixed cleaning slot is enabled, this cell becomes the fixed cleaning slot (labeled 01* in Figure 2-1) and all storage element numbers reduce by one. The fixed cleaning slot will not be accessible through SCSI.

- **I/E Port disabled/No fixed cleaning slot (Magnum 224 or StorageLibrary T24)**—This figure shows the element addresses for this configuration.

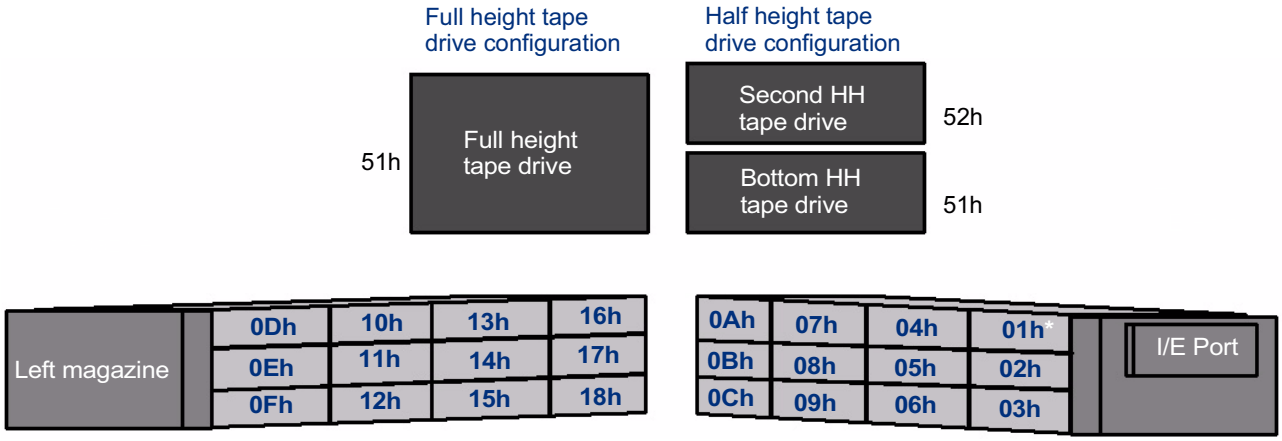


Figure 2-2 *Mag 224/T24 element addresses (I/E port disabled/no fixed cleaning slot)*

Note: If the fixed cleaning slot is enabled, this cell becomes the fixed cleaning slot (labeled 01* in Figure 2-2) and all storage element numbers reduce by one. The fixed cleaning slot will not be accessible through SCSI.

- **I/E Port enabled/No fixed cleaning slot (StorageLoader 2U LTO)**—This figure shows the element addresses for this configuration.

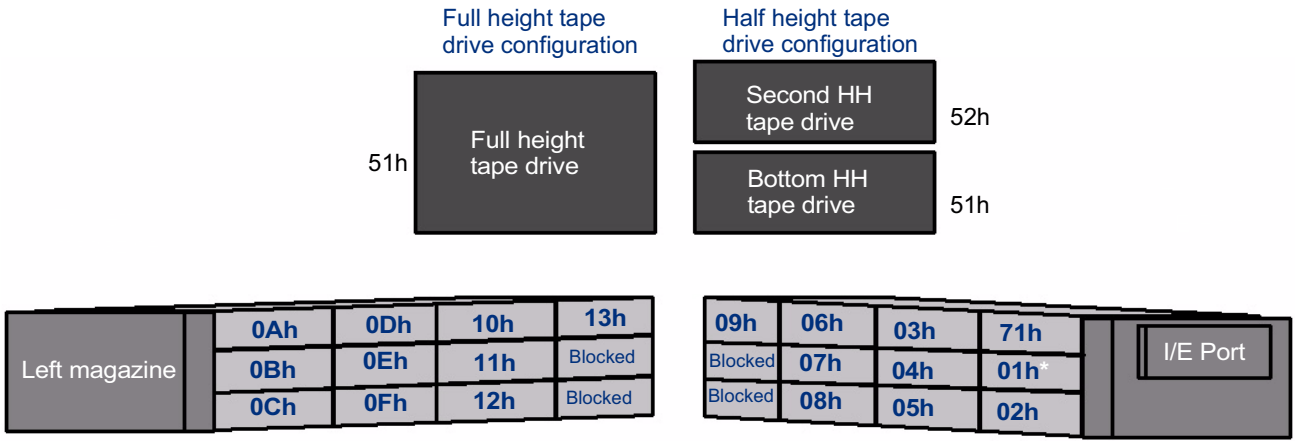


Figure 2-3 *StorageLoader 2U LTO element addresses (I/E port enabled/no fixed cleaning slot)*

Note: If the fixed cleaning slot is enabled, this cell becomes the fixed cleaning slot (labeled 01* in Figure 2-3) and all storage element numbers reduce by one. The fixed cleaning slot will not be accessible through SCSI.

- **I/E Port disabled/No fixed cleaning slot (StorageLoader 2U LTO)**—This figure shows the element addresses for this configuration.

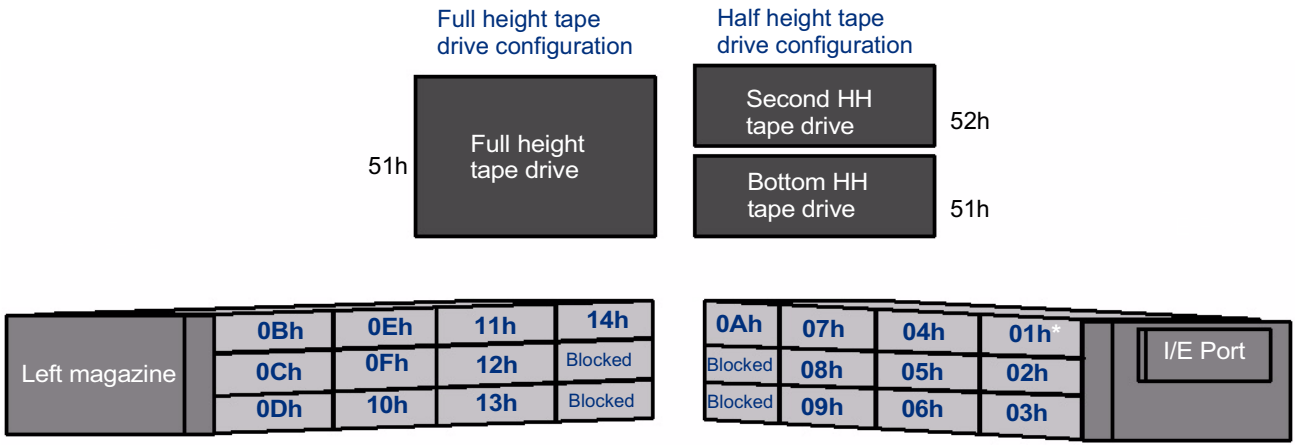


Figure 2-4 *StorageLoader 2U LTO element addresses (I/E port disabled/no fixed cleaning slot)*

Note: If the fixed cleaning slot is enabled, this cell becomes the fixed cleaning slot (labeled 01* in Figure 2-4) and all storage element numbers reduce by one. The fixed cleaning slot will not be accessible through SCSI.

Magnum 448 Element Addresses

The following illustrations show the Magnum 448 element address with three different configurations.

- **Both I/E Ports enabled/No fixed cleaning slot (Magnum 448)**—The following figure shows the element addresses for this configuration.

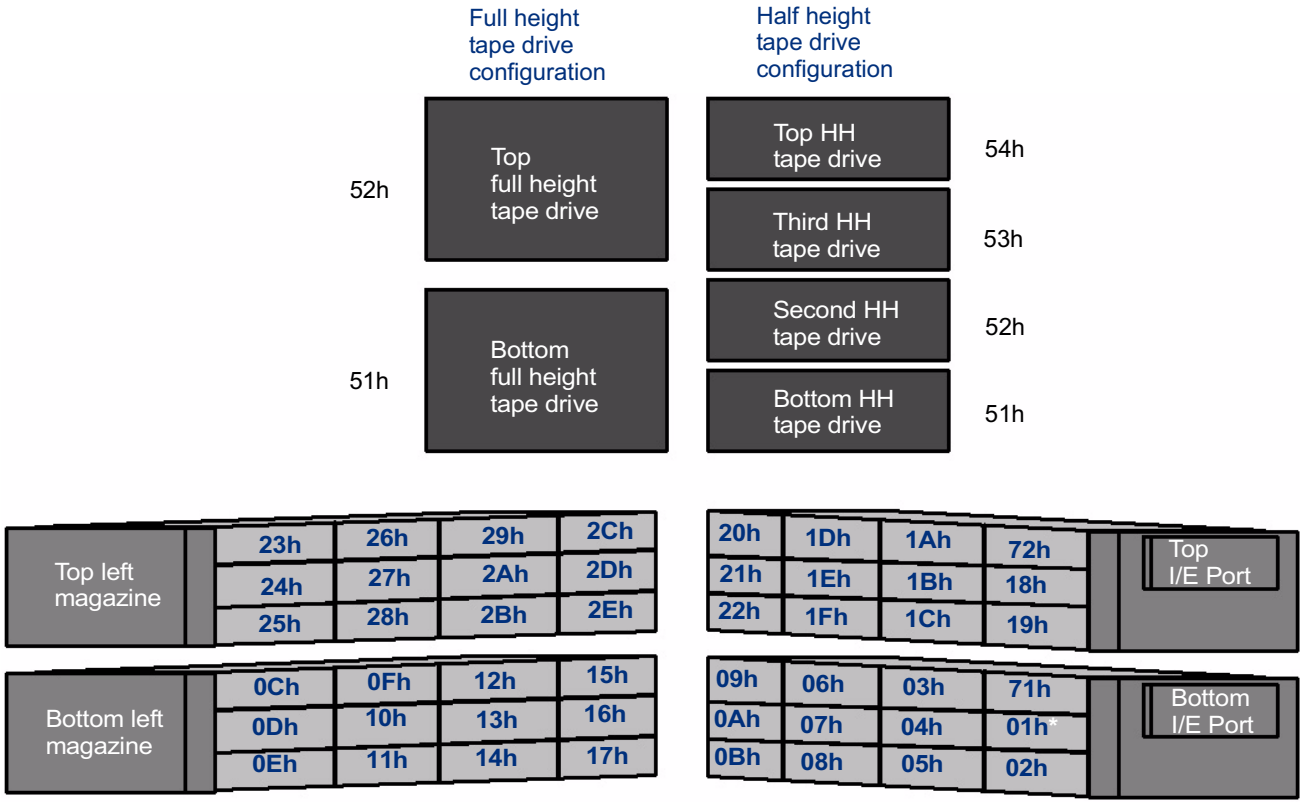


Figure 2-5 *Magnum 448 Element addresses (both I/E ports enabled/no fixed cleaning slot)*

Notes: If both I/E Ports are enabled, the bottom port has an address of 71h and the top port has an address of 72h. If only one I/E Port is enabled (bottom or top), its address is 71h.

The top I/E Port (enabled versus disabled) only affects the top magazine addresses (right and left).

The bottom I/E Port affects *all* the magazine addresses.

If the fixed cleaning slot is enabled, this cell becomes the fixed cleaning slot (labeled 01* in Figure 2-5) and all storage element numbers reduce by one. The fixed cleaning slot will not be accessible through SCSI.

- **I/E Port 1 (bottom) enabled, I/E Port 2 (top) disabled/No fixed cleaning slot (Magnum 448)**—The following figure shows the element addresses for this configuration.

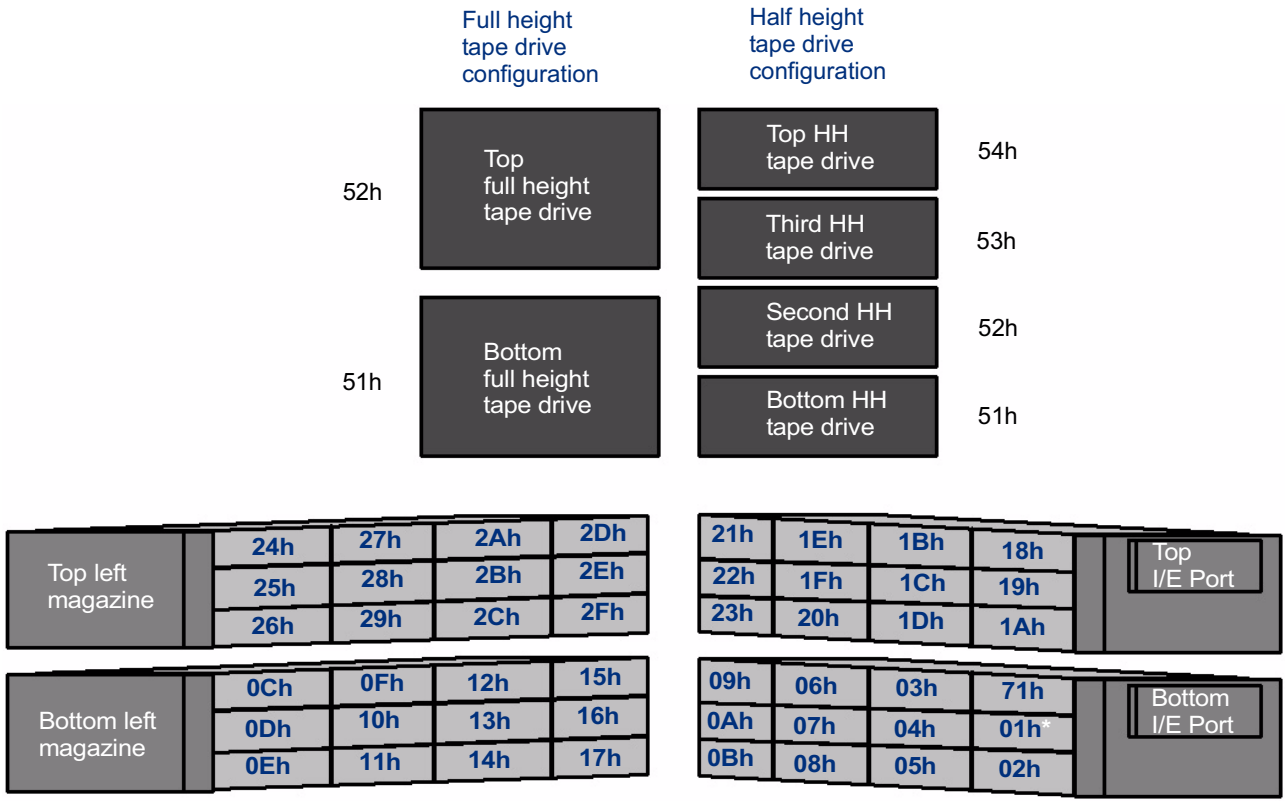


Figure 2-6 *Magnum 448 Element addresses (I/E port 1 enabled, I/E port 2 disabled/no fixed cleaning slot)*

Notes: If only one I/E Port is enabled (bottom or top), its address is 71h.

The top I/E Port (enabled versus disabled) only affects the right and left *top* magazine addresses.

The bottom I/E Port affects *all* the magazine addresses.

If the fixed cleaning slot is enabled, this cell becomes the fixed cleaning slot (labeled 01* in Figure 2-6) and all storage element numbers reduce by one. The fixed cleaning slot will not be accessible through SCSI.

- **Both I/E Ports disabled/No fixed cleaning slot (Magnum 448)**—The following figure shows the element addresses for this configuration.

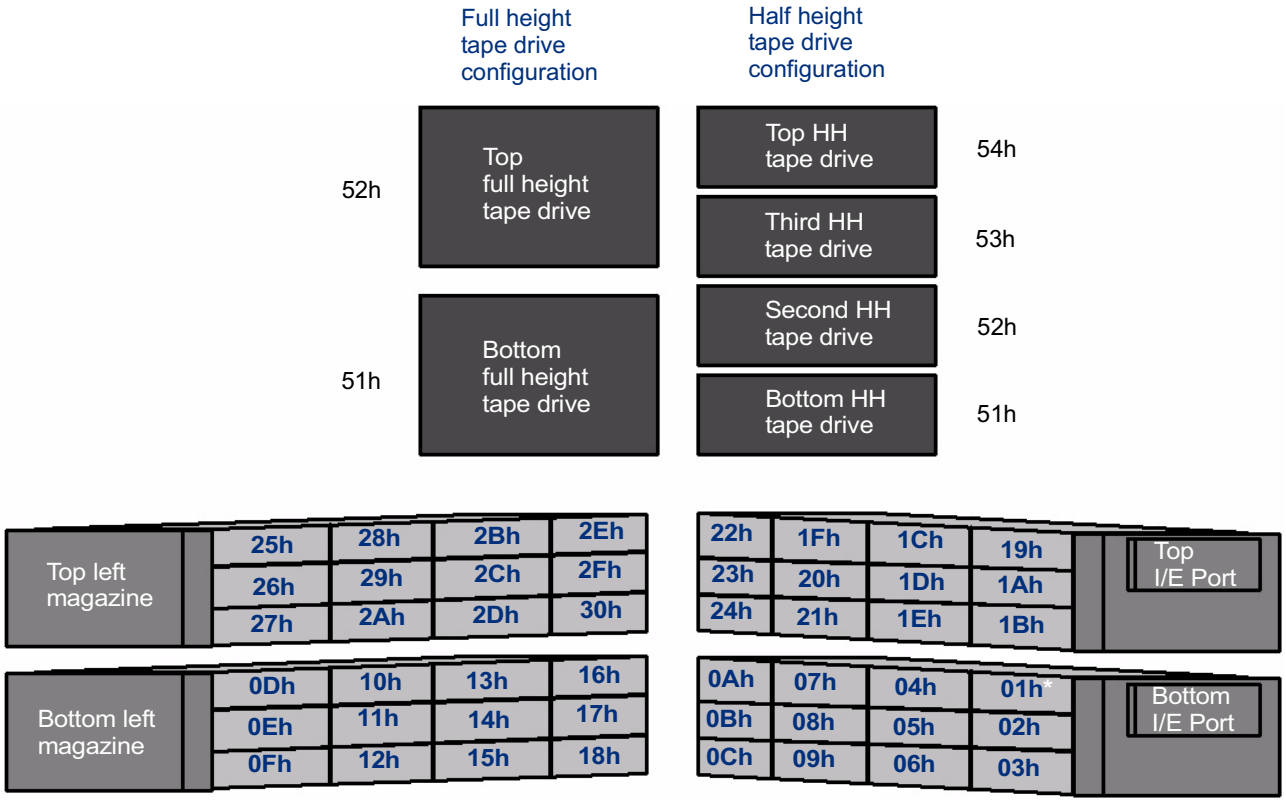


Figure 2-7 *Magnum 448 Element addresses (both I/E ports disabled/no fixed cleaning slot)*

Note: If the fixed cleaning slot is enabled, this cell becomes the fixed cleaning slot (labeled 01* in Figure 2-7) and all storage element numbers reduce by one. The fixed cleaning slot will not be accessible through SCSI.

2.2 SCSI COMMAND PROTOCOL

This section describes the SCSI commands supported by the library. The host (or initiator) uses these commands to interact with the library. This section also describes the command status information returned by the library.

2.2.1 SUPPORTED SCSI COMMANDS

The initiator sends commands to the library to request an operation. Chapter 4 through Chapter 25 contain the detailed descriptions of the SCSI commands. The commands are arranged in alphabetical order with each command starting in a new chapter. For ease of reference, the command name and operation code (OP code) are included in the header at the top of each page.

Table 2-1 lists and briefly describes the SCSI commands supported by the library.

Note: The commands issued to the library are independent of the commands issued to the tape drive. For information about the commands for the tape drive, refer to the documentation for the tape drive.

Table 2-1 *SCSI command set supported by the library*

When you issue this command …	OP Code	The library does this …	Discussed in...
INITIALIZE ELEMENT STATUS (6 bytes)	07h	Checks all element addresses for cartridges and scans bar code labels.	Chapter 4
INITIALIZE ELEMENT STATUS WITH RANGE (10 bytes)	37h	Checks a range of elements or all the storage elements for cartridges and scans bar code labels.	Chapter 5
INQUIRY (6 bytes)	12h	Sends information about its parameters, including the library serial number, to the initiator.	Chapter 6
LOG SELECT (10 bytes)	4Ch	Manages statistical information maintained by the library.	Chapter 7
LOG SENSE (10 bytes)	4Dh	Returns statistical and condition information to the initiator.	Chapter 8
MODE SELECT (6 bytes)	15h	Accepts specific element addresses, LCD information, and operating parameters from the initiator. Can also prevent access to selected operator panel menus.	Chapter 9
MODE SENSE (6 bytes)	1Ah	Reports its operating mode parameters to the initiator.	Chapter 10
MOVE MEDIUM (12 bytes)	A5h	Moves a cartridge from one location to another.	Chapter 11
POSITION TO ELEMENT (10 bytes)	2Bh	Positions the cartridge loader at a specific location (element address).	Chapter 12
PREVENT/ALLOW MEDIUM REMOVAL (6 bytes)	1Eh	Disables or enables the interlock mechanism in the cartridge access port, preventing or allowing the user from accessing cartridges through the cartridge access port.	Chapter 13
READ BUFFER (10 bytes)	3Ch	Copies the library's microcode. Used in conjunction with the WRITE BUFFER command.	Chapter 14
READ ELEMENT STATUS (12 bytes)	B8h	Reports the status of its medium transport, storage, import/export, and data transfer elements to the initiator.	Chapter 15
RECEIVE DIAGNOSTIC RESULTS (6 bytes)	1Ch	Returns diagnostic results from the last SEND DIAGNOSTIC command.	Chapter 16
RELEASE (6 bytes or 10 bytes)	17h 57h	Releases the library from reservations previously set by the initiator using the RESERVE command.	Chapter 17
REQUEST SENSE (6 bytes)	03h	Returns sense data to the initiator.	Chapter 18

Table 2-1 *SCSI command set supported by the library (continued)*

When you issue this command …	OP Code	The library does this …	Discussed in...
REQUEST VOLUME ELEMENT ADDRESS (12 bytes)	B5h	Returns the element descriptors (including element address and status flags for each element) created as a result of the SEND VOLUME TAG command. Data is returned in element address order.	Chapter 19
RESERVE (6 bytes or 10 bytes)	16h 56h	Reserves the library for the initiator's use.	Chapter 20
REZERO UNIT (6 bytes)	01h	Implemented to provide software compatibility when it is required. Because the library does not need to calibrate its mechanics, it always returns and immediate Good status in response to this command.	Chapter 21
SEND DIAGNOSTIC (6 bytes)	1Dh	Requests that a self test or another specific test be performed.	Chapter 22
SEND VOLUME TAG (12 bytes)	B6h	Compares the template it receives from the initiator to the cartridge inventory information in memory, and determines which bar code labels match the template.	Chapter 23
TEST UNIT READY (6 bytes)	00h	Informs the initiator whether it is ready to accept all other commands.	Chapter 24
WRITE BUFFER (10 bytes)	3Bh	Writes new microcode received from the initiator into its flash EEPROM. The new microcode must be sent in sections through multiple WRITE BUFFER commands.	Chapter 25

2.2.2 SCSI COMMAND FORMAT

The library uses six-, ten-, and twelve-byte commands, whose formats are described in the SCSI-3 standards (SPC-2, SMC-2, SAM-2). Any command descriptor block (CDB) fields that are specific to the library for a given command are described in the command chapter. This section describes the CDB fields that are common for every command.

Note: Any errors caused by illegal parameters in a CDB or parameter list for a particular command are listed at the end of the command chapter. Errors of this type return a sense key of Illegal Request (5h).

- The word *Reserved* or *RSVD* has one of the following meanings when used in a SCSI command field definition:
  - The field is defined as reserved by the *ANSI Small Computer System Interface (SCSI)* standard. The library checks these fields for a value of 0. If zeros are not present, the library returns Check Condition status with the sense key set to Illegal Request (5h).

- The field description, "This field not supported by the library," indicates that the field is supported by the SCSI-3 standards, but has not been defined in the Tandberg Data implementation of the command. These fields are reserved for future enhancements. The library ignores these fields and does not check for illegal values.

- The vendor unique portion of the Control byte (as indicated in the SCSI standard) is defined for each specific command, if used. The library does not support linked commands or recognize the Flag bit.
- Fields containing only one bit are usually referred to as the name bit instead of the name field.
- Numbers that are not immediately followed by lower-case b or h are decimal values.
- Numbers immediately followed by lower-case b (*nn*b) are binary values.
- Numbers or upper case letters immediately followed by lower-case h (*nn*h) are hexadecimal values.

2.2.3 COMMAND STATUS

The library sends one status byte to the initiator at the completion of a command. The status byte is formatted as follows:

Bit Byte	7	6	5	4	3	2	1	0
00	Reserved		Status Byte Code					

Table 2-2 contains a summary of the status bytes used by the library.

Note: The library may go to the Bus Free phase without reporting status in response to a command sequence. If this happens, immediately issue a REQUEST SENSE (03h) command to determine the cause of the unexpected disconnect.

Table 2-2 *SCSI command status bytes supported by the library*

Status	Hex Value	Description
Good	00h	Indicates that the library successfully completed the operation specified by the CDB.
Check Condition	02h	Indicates an error, exception, or abnormal condition that has caused sense information to be set.
Busy	08h	Indicates that the library is unable to accept a command from an initiator.
Reservation Conflict	18h	Indicates that the library is reserved by another initiator.

Status Descriptions

The following are expanded descriptions of the status bytes listed in Table 2-2.

Good The library returns Good status to indicate that the operation specified by the CDB completed normally.

Check Condition The library returns Check Condition status to indicate that an error has occurred while it was executing a command. The library reports Check Condition status as soon as it detects the error unless it is disconnected from the SCSI bus. If the library is disconnected, it reports Check Condition status after the reconnect process.

Examples of situations that result in Check Condition status are listed below:

- You send an Identify message with an invalid LUN followed by a command other than INQUIRY or REQUEST SENSE.
- You send a command other than INQUIRY or REQUEST SENSE when there is a pending Unit Attention condition of the library.
- The library has an unrecoverable hardware error and receives a motion command.
- The library is not ready when it receives a motion command.
- You set a reserved field to a value other than 0 in the CDB or the parameter list for the requested command.
- You specify an invalid parameter in the CDB or parameter list for the requested command.
- The command fails for one of the reasons listed in the command chapter. For example, a MOVE MEDIUM command terminates with Check Condition status if the source for the move is empty.
- For specific situations that return Check Condition status, refer to the command descriptions in Chapter 4 through Chapter 25.

Busy Indicates that the library is temporarily unable to accept a command from this initiator. The initiator may retry the command later.

Reservation Conflict The library returns Reservation Conflict status to indicate that the library is currently reserved by another initiator. This status is reported until the initiator that reserved the library issues a RELEASE (17h or 57h) command or a reset condition occurs.

2.2.4 COMMAND FORMAT ERRORS

A command format error may occur when:

- The Operation Code in the CDB is not supported by the library.

- The value of the bytes or bits in a Reserved field (as defined by the SCSI standard) is not 0.
- The value of the Link or Flag fields in the Control byte (bits 1 and 0) of the CDB are not 0, or the value of the Vendor Unique fields (bits 7 and 6) are not valid as defined for the specific command.

For all command format errors, the library terminates the command and returns Check Condition status to the initiator. The sense data is set as follows:

- The sense key is set to Illegal Request (5h).
- Depending on the specific error, the Additional Sense Code (ASC) is set to Illegal Operation Code (20h), Logical Unit Not Supported (25h), or Invalid Field in CDB (24h).
- The Additional Sense Code Qualifier (ASCQ) is set to 0.
- The sense key specific data indicates the location of the error.

2.3 FIBRE CHANNEL INTERFACE SPECIFICATIONS (FC TAPE DRIVE)

Fibre Channel cables are not included with the library. The number of optical fiber cables required for attaching the library to a Fibre Channel network depends on how many tape drives are installed.

Each of the tape drive optical fiber ports contains a transmitter and receiver optical subassembly. The transmitter subassembly contains an internal semiconductor laser diode that operates at a wavelength of 850 nm (nanometers).

Use either 50-micron or 62.5-micron multi-mode optical fiber cables with dual single-channel (LC) connectors.

- 50-micron multi-mode optical fiber cables must comply with the 400-M5-SN-I classification as specified in the Fibre Channel standard (FC-PI-2).
- 62.5-micron multi-mode optical fiber cables must meet the 400-M6-SN-I classification.

Table 2-3 *Multi-mode optical cable characteristics*

Cable type	Transmitter	Data Rate (MB/sec.)	Maximum Distance
50-micron multi-mode fiber[a]	850 nm shortwave laser	400	.5 m – 150 m
62.5-micron multi-mode fiber[b]	850 nm shortwave laser	400	.5 m – 70 m

[a] Complies with the 400-M5-SN-I classification

[b] Complies with the 400-M6-SN-I classification

Notes

3

IMPLEMENTING SCSI OPERATIONS

This chapter provides information about performing the following common SCSI operations:

- Setting the operation mode (Random/Sequential)
- Resetting the library
- Setting element addresses
- Using the cartridge inventory
- Moving cartridges
- Inquiring about the status of a specific operation
- Performing diagnostic tests

For detailed information about the SCSI commands that the library uses to perform these operations, refer to Chapter 4 through Chapter 25.

3.1 SETTING THE OPERATION MODE

The operation mode determines how the library processes cartridges. **Before using the library as a SCSI device, it must be set to Random mode** (the factory default setting).

! Important If you are using a backup application which is capable of controlling the library, do *not* configure the library to operate in Sequential mode.

When the device is in Sequential Mode, all SCSI commands that require the library to be READY will get a CHECK CONDITION, NOT READY, with ASC/ASCQ of 04/8E (Not Ready Sequential Mode) and an FSC of 0x2B (In Sequential Mode).

The library will operate using one of these two options.

- Random–The library processes cartridges according to commands issued from an application. Random is the default operating mode for the library.

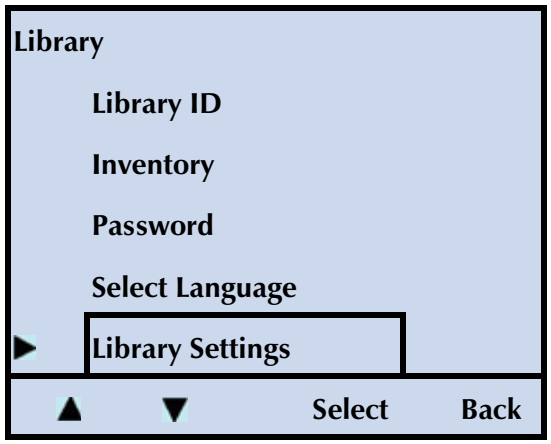
- Sequential–The library processes cartridges sequentially without direction from an application. In Sequential mode, magazines are automatically associated with tape drives so that each tape drive and its associated magazine (or magazines) becomes an independent autoloader.

If you previously set the library to operate in Sequential mode, and need to change it to Random mode, follow these steps:

1. At the Home screen, press **Lib**.

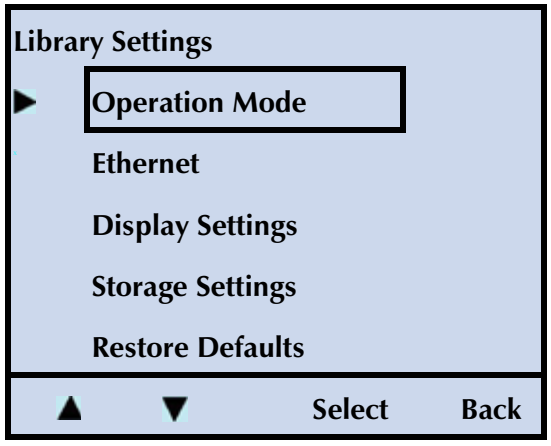
   If necessary, enter the operator panel password (see the *Product Manual* at www.tandbergdata.com for detailed instructions on how to access a password-protected library).

2. Press ▼ until the selection arrow (▶) points to **Library Settings**.

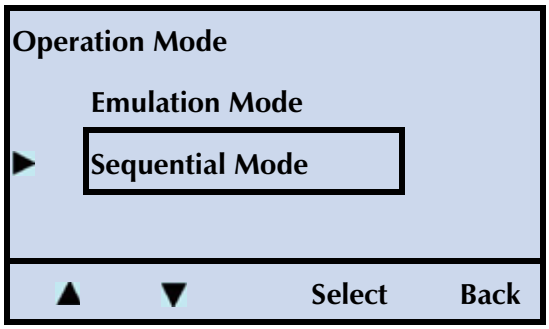


3. Press **Select**.

4. Press ▼ until the selection arrow (▶) points to **Operation Mode**.

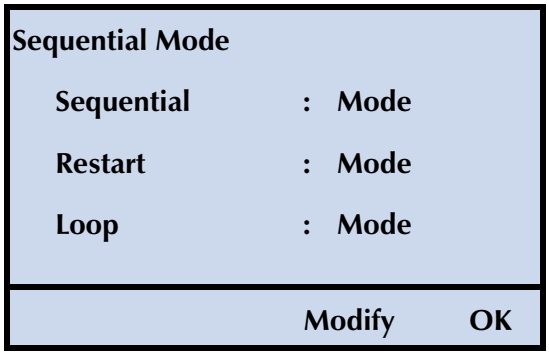


5. Press **Select**. Press ▼ until the selection arrow (▶) points to **Sequential Mode**, and press **Select**.

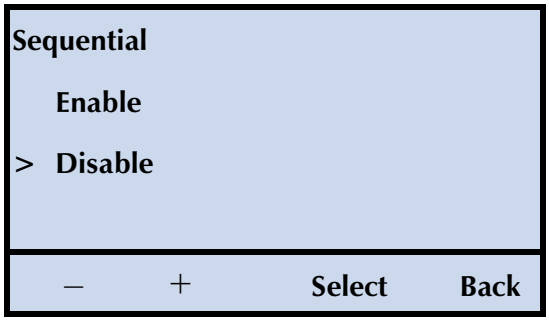


Disabling Sequential Mode

a. Press **Modify**.



b. At the first screen (Sequential), press + or – to select *Disable*.



c. Press **Select**.

Setting the Restart Option

The Restart option determines what the library does after it is reset, power cycled, or when a magazine has been re-inserted.

Option set to...	The library does this...
Enabled	Restarts at the beginning of the cartridge sequence
Disabled	Resumes where it left off when the interruption occurred

Setting the Loop Option

The Loop option determines what the library does after it has finished processing the last cartridge in the sequence.

Option set to...	The library does this...
Enabled	Loops back to the first cartridge in the sequence and begins processing the cartridges again
Disabled	Stops and waits for operator intervention. Operator intervention typically means removing cartridges for storage and inserting new cartridges

6. Press **OK**.
7. Press **Back** (as needed) to return to the Home screen.

See the *Product Manua*l for additional information about Operation modes.

3.2 RESETTING THE LIBRARY AND TAPE DRIVE

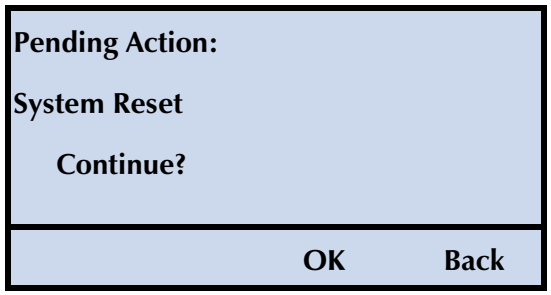
You can use any of the following methods to reset the library and its tape drive.

! Important When active termination of the SCSI bus is used, powering off the device that supplies terminator power for the SCSI bus leaves the RST line in an indeterminate state (either reset or not, depending on the voltages). In this situation, it may be impossible to communicate with the library.

- **Power-on reset.** Power the library off and back on again to reset the library and its tape drive.

! Important Before powering off the library, first unload the cartridge from the tape drive, if possible.

- **Operator panel reset.** At the Home screen, press Maintenance/ System Reset. The following screen appears.



Press **OK** to reset the library. The library resets and performs a cartridge inventory. When the reset is complete, the Home screen appears.

- **SCSI bus reset.** SCSI Bus Reset is handled by the tape drive and only affects the library indirectly through the ADI.
- **SCSI Target Reset message.** SCSI Target Reset message is handled by the tape drive and only affect the library indirectly through the ADI.

Note: If the library is performing a cartridge move operation when it is reset, it completes the move operation during POST.

3.2.1 EFFECT OF POWER-ON RESETS

The power-on reset has the following effects:

- The checksum of the flash code is validated.
- All library parameters are reset to their default or saved values.
- The library performs its power-on self-test.
- A power-on reset of the library also resets the tape drive and causes them to perform their power-on self tests.

After a power-on reset, the library will respond to SCSI commands as soon as the tape drive is ready to respond on the SCSI bus.

3.2.2 EFFECT OF FRONT PANEL RESETS

A front panel reset has the following effects:

- The checksum of the library's flash code is validated.
- All library parameters are reset to their default or saved values.
- The library performs its power-on self-test.

After an operator panel reset, the library will respond to SCSI commands as soon as the tape drive is ready to respond on the SCSI bus.

3.3 SETTING ELEMENT ADDRESSES

If you want, you can assign different element addresses to the library's tape drive(s), cartridge loader, I/E port, and cartridge cells (the data transfer, medium transport, I/E port, and storage elements, respectively).

- **Magnum 224, T24, or SL 2U**—"Magnum 224, T24, or SL 2U Element Addresses" on page 2-3 shows the default element address assigned to each element in the library with two configurations.
- **Magnum 448**—"Magnum 448 Element Addresses" on page 2-5 shows the default element address assigned to each element in the library with three configurations.

If desired, you can use the MODE SELECT (15h) command to change the element addresses assigned to the different types of elements. The element addresses for the cartridge cells are numbered consecutively, with the first address being the starting element address that you specify for the storage elements. To view the current addresses, use the MODE SENSE (1Ah) command.

3.4 UNDERSTANDING THE CARTRIDGE INVENTORY

The library maintains a cartridge inventory in volatile memory. The inventory is automatically re-established whenever a cartridge is Imported or Exported from the library. The inventory contains information about the following element locations:

Element	Description
Medium transport	The cartridge handling mechanism (robot) is the medium transport element. This mechanism moves the cartridges between the tape drive(s) and the storage cells.
Storage (slots/cells)[a]	▪ Magnum 224 or T24—24 storage elements ▪ SL 2U—20 storage elements ▪ Magnum 448—48 storage elements
Data transfer	A tape drive is a data transfer element that reads and writes data as requested by the host. ▪ Magnum 224, T24, or SL 2U—one or two data transfer elements ▪ Magnum 448—one, two, three, or four data transfer elements
Import/Export[a]	▪ Magnum 224, T24, or SL 2U—one I/E port element ▪ Magnum 448—two I/E port elements

[a] The storage slots/cells increase or decrease based on the I/E Ports setting (enabled or disabled). Disabling the I/E Ports increase the storage slot/cell count. You can also assign slot/cell 2 as a "fixed" cleaning slot (see the *Magnum 224, StorageLibrary T24, or StorageLoader 2U LTO Library Product Manual* or the *Magnum 448 LTO Library Product Manual*).

The library uses the information stored in the cartridge inventory to process SCSI commands.

3.4.1 ESTABLISHING THE CARTRIDGE INVENTORY

The library automatically updates the cartridge inventory when it is powered on, whenever a magazine is inserted, or whenever the cartridge access port door is opened, then closed again. You can use the INITIALIZE ELEMENT STATUS (07h) or INITIALIZE ELEMENT STATUS WITH RANGE (37h) command to attempt reading a bar code label that could not be read during the most current cartridge inventory operation.

3.4.2 RETRIEVING CARTRIDGE INVENTORY INFORMATION

After the library inventory has completed, you can retrieve the inventory information by issuing a READ ELEMENT STATUS (B8h) command (see Chapter 15).

3.4.3 TYPES OF INFORMATION STORED IN THE CARTRIDGE INVENTORY

As described in this section, the cartridge inventory contains the following information for every element location:

- Element address
- Element occupied status
- Bar code label information
- Tape drive accessible status
- Cartridge pick and put (place) retry counts
- Total number of cartridge picks and puts (places)
- Source element address

Element Addresses

The cartridge inventory contains an Element Address field for each element location. You use element addresses to reference element locations when you issue SCSI commands to the library, when specifying sources and destinations for operator panel move operations, and when performing diagnostics. If desired, you can change element addresses using the MODE SELECT (15h) command (see Chapter 9).

Magnum 224, T24, or SL 2U Element Addresses The default element addresses for the library are listed in Table 3-1. The addresses change when you enable the I/E port and the fixed cleaning cell. See "Magnum 224, T24, or SL 2U Element Addresses" on page 2-3 for additional information.

Table 3-1 *Magnum 224, T24, or SL 2U default element addresses*

Element Type		Default Element Address
All storage elements (Magnum 224 or T24) All storage elements (StorageLoader 2U)		1h to 18h 1h to 14h
Data transfer element (tape drive)	Second half height Bottom half height	52h 51h
	Full height	51h
Medium transport (robot)		61h
I/E Port element (cartridge access port)[a]		71h

[a] If enabled.

Magnum 448 Element Addresses The default element addresses for the Magnum 448 library are listed in Table 3-2. The addresses change when you enable the I/E ports and the fixed cleaning cell. See "Magnum 448 Element Addresses" on page 2-5 for additional information.

Table 3-2 *Magnum 448 default element addresses*

Element Type		Default Element Address
All storage elements		1h to 47h
Data transfer element (tape drive)	Top half height Third half height Second half height Bottom half height	54h 53h 52h 51h
	Top full height Bottom full height	52h 51h
Medium transport (robot)		61h
I/E Port element (cartridge access port)[a]	Top I/E port Bottom I/E port	72h 71h

[a] If enabled.

Element Occupied Status

The library uses the Occupied and Occupied Valid flags in the cartridge inventory to determine whether a given element is occupied as follows:

Occupied The Occupied flag indicates whether the library considers the specified element location to contain a data cartridge, as follows:

0	The element location does not contain a data cartridge
1	The element location contains a data cartridge

Occupied Valid The Occupied Valid flag indicates whether the Occupied flag is accurate, as follows:

0	The Occupied flag is questionable (may not be accurate)
1	The Occupied flag is accurate

Bar Code Label Information

These fields are used only if you have attached bar code labels to each data cartridge and you have scanned the labels. Refer to the *Product Manual* for information about placing the labels on the cartridges. For specifications for the bar code labels that can be used with the library, refer to the *Tandberg Data Bar Code Specification for LTO Ultrium Cartridges*.

The library uses the following fields in the cartridge inventory to indicate bar code label information:

Label If the element location contains a cartridge whose bar code label has been scanned, the Label field contains the cartridge label.

Label Valid The Label Valid field indicates whether the Label field is accurate, as follows:

0	The Label field is not accurate
1	The Label field is accurate

The Label Valid flag is set to 0 after the library is reset or when the cartridge access port door is opened to indicate that a cartridge may have been added or removed from the location. The Label Valid flag is set to 1 when the label is successfully scanned.

Label Error The Label Error field indicates whether the bar code scanner was unable to read the cartridge label, as follows:

0	The bar code scan was successful, a reset condition occurred, or the cartridge access port door was opened
60	The bar code scanner could not read the bar code label because there was no label on the cartridge
61	A bar code label was detected but could not be read
65	The bar code label could not be read because of a hardware error

Label Scan Retries The Label Scan Retries field contains the total number of bar code scanner retries for each cartridge. This field is cleared when the library is reset.

Send Volume Match The Send Volume Match flag indicates whether the cartridge label matched the template sent with the last SEND VOLUME TAG (B6h) command, as follows:

0	The label did not match the template
1	The label matched the template

The REQUEST VOLUME ELEMENT ADDRESS (B5h) command references the Send Volume Match flag for the cell and sets it to 0 after the label information is returned to the initiator. This flag is also set to 0 when the library is reset or when the cartridge access port door is opened.

Tape Drive Accessible

The Tape Drive Accessible flag indicates whether the tape drive is empty, a cartridge is loaded in the tape drive, or the cartridge is ejected, as follows:

0	A cartridge may be loaded in the drive
1	The drive is empty, or the cartridge is unloaded or ejected and ready to be picked

This flag is set to 0 when the library loads a cartridge in the tape drive and after the library is reset or the cartridge access port door is opened.

This flag is set to 1 when the library detects that the tape drive is accessible. The library can detect that the drive is accessible after a move operation, after a cartridge scan operation, or when the tape drive notifies the library that it is accessible.

Cartridge Pick and Put Retry Counts

The Cartridge Pick Retry Counts and Cartridge Put Retry Counts fields indicate the total number of pick/put operation retries for each element location. These fields are cleared when the library is reset.

Total Number of Cartridge Puts

The Total Number of Cartridge Puts field indicates the total number of put operations for each element location. Each time a cartridge is moved to an element location, the total number of puts for that location is incremented. This field is cleared when the library is reset.

Source Element Address

The Source Element Address field shows the address of the last storage element from which the cartridge was moved.

3.5 MOVING CARTRIDGES

To instruct the library to move cartridges between a storage location and the tape drive, issue the MOVE MEDIUM (A5h) command. The MOVE MEDIUM command allows you to specify a source element address and a destination element address for a specific move operation. See Chapter 11, "MOVE MEDIUM (A5h).

3.6 INQUIRING ABOUT LIBRARY STATUS

To inquire about the library status, you can use the following commands:

TEST UNIT READY (00h) Command

Use this command to determine if the library is ready to accept all other valid commands, including motion commands. This is not a request for a self-test, which occurs at power-on. This command returns Good status if the library is ready to accept any valid command without returning Check Condition, Reservation Conflict, or Busy status.

REQUEST SENSE (03h) Command

If an error occurs during an operation, use the REQUEST SENSE (03h) command to determine the type of error. This command returns the following information:

- Sense key for the error indicating the type of error (Not Ready, Hardware Error, Illegal Request, Unit Attention, or Aborted Command)
- Additional sense code (ASC) indicating the type of error in the given sense key category
- Additional sense code qualifier (ASCQ) indicating the specific error in the sense key and ASC categories

INQUIRY (12h) Command

Use the INQUIRY (12h) command to obtain the library's Product Identification and Vendor ID. You can also obtain information about the library's microcode level and the version of SCSI supported by the library.

LOG SENSE (4Dh) Command

Use the LOG SENSE command to retrieve the library's statistical and state information. This type of information includes the following:

- Tape Alert flags
- System statistics
- Element statistics
- Cartridge scan retries
- Environmental data
- Command failure information

3.7 PERFORMING DIAGNOSTICS

You can perform diagnostics to find out detailed information about library operations. The SEND DIAGNOSTIC (1Dh) command allows you to run special diagnostic tests. The RECEIVE DIAGNOSTIC RESULTS (1Ch) command allows you to obtain diagnostic results of library operations.

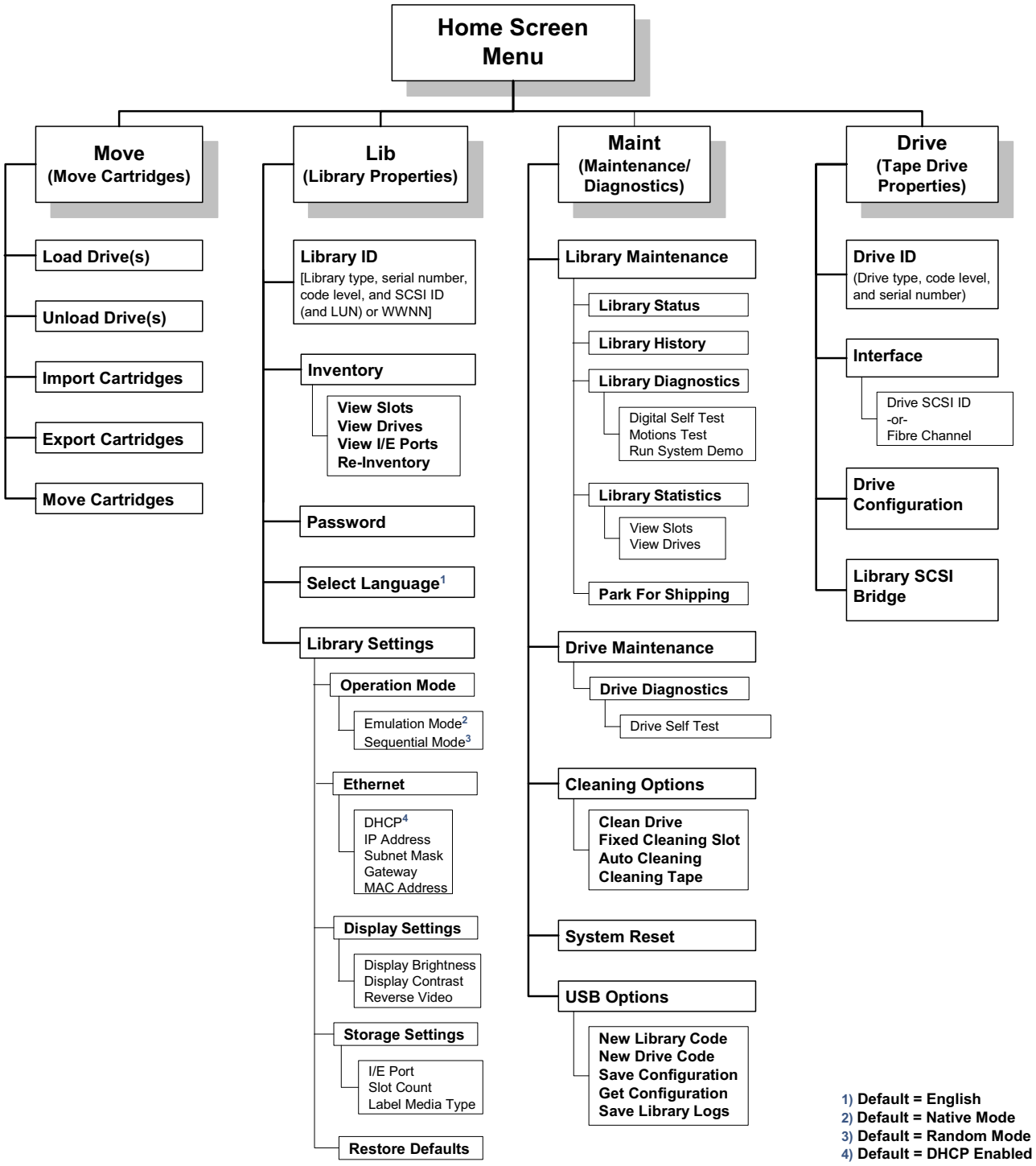


Figure 3-1 *Library menu organization*

4

INITIALIZE ELEMENT STATUS (07h)

Bit Byte	7	6	5	4	3	2	1	0
00	0	0	0	0	0	1	1	1
01	Reserved							
02	Reserved							
03								
04								
05	NBL	Reserved						

4.1 About This Command

The INITIALIZE ELEMENT STATUS command causes the library to attempt reading any bar code labels that were unreadable during the automatic cartridge inventory. The library checks the elements in ascending element address order (see "Elements and Element Addresses" on page 2-2 for more information about element addresses). The information obtained by this command can be returned to the initiator using the READ ELEMENT STATUS (B8h) command.

Notes:

- The average time required to complete this command is:
  Magnum 224 or T24—12 seconds for a single cell and 120 seconds for 24 cells.
  StorageLoader 2U—12 seconds for a single cell and 100 seconds for 20 cells.
  Magnum 448—16 seconds for a single cell and 240 seconds for 48 cells.
- Support for the INITIALIZE ELEMENT STATUS command is provided for compatibility. The library automatically re-establishes the cartridge inventory immediately after power-on, whenever a magazine is inserted, or whenever the cartridge access port door is opened, then closed again. Issuing a INITIALIZE ELEMENT STATUS command causes the library to attempt reading any bar code labels that were unreadable during the most current inventory operation.

- For specifications for the bar code labels that can be used with the library, refer to the *Tandberg Data Bar Code Label Specification for LTO Ultrium Cartridges*.
- For best bar code scan results, refer to *Magnum 224, StorageLibrary T24, or StorageLoader 2U LTO Library Product Manual* or the *Magnum 448 LTO Library Product Manual* for information about positioning the bar code labels on data cartridges.
- The bar code scanner cannot scan a label on a cartridge that is loaded in a tape drive.

4.2 WHAT YOU SEND TO THE LIBRARY

NBL (No Barcode Labels) – Byte 05, Bit 7

The library ignores this bit. If a cartridge does not have a bar code label, the cartridge inventory indicates that the label is unreadable.

4.3 EFFECTS ON THE CARTRIDGE INVENTORY

The library updates the cartridge inventory whenever it is powered on, whenever a magazine is inserted, or whenever the cartridge access port door is opened, then closed again. During the inventory it checks for the presence of a cartridge at each location and scans the bar code labels. This section describes how the library updates the cartridge inventory.

Table 4-1 and Table 4-2 illustrate the various outcomes of a requested scan operation and the effect on the cartridge inventory.

- A request is made to scan a cartridge in a storage location and the scan operation completed successfully (the bar code scanner was able to read the label on the cartridge or the location was empty). See Table 4-1 for details about how the cartridge inventory is updated.

Table 4-1 *Effect on the cartridge inventory of a cartridge scan in a storage location*

This cartridge inventory field...	... is changed to the following when...	
	... the location is empty	... the location is full
Occupied	0	1
Occupied Valid	1	1
Label	blanks	cartridge label
Label Valid	0	1
Label Scan Retries	0	updated if retried
Source Storage Element Address	no change	no change

- A request is made to scan a cartridge in a storage location and the operation failed because the bar code scanner was unable to read the label on the cartridge or if the cartridge does not have a label. The scan will not fail if the location is empty. See Table 4-2 for details about how the cartridge inventory is updated.

Table 4-2 *Effect on the cartridge inventory when a request for a cartridge scan fails*

This cartridge inventory field...	...is changed to the following when the library cannot read the cartridge label
Occupied	1
Occupied Valid	1
Label	blanks
Label Valid	0
Label Scan Retries	updated if retried
Source Storage Element Address	no change

4.4 COMMAND STATUS

The library returns a status byte after processing the INITIALIZE ELEMENT STATUS command as follows:

Good

The library returns Good status when it is able to process the command without errors.

Busy

Busy status indicates that the library is temporarily unable to accept a command from this initiator. The initiator may retry the command later.

Reservation Conflict

The library returns Reservation Conflict status when it is reserved by a different initiator. See Chapter 20 for more information about the RESERVE command.

Check Condition

Check Condition status is returned for the following reasons:

- A Unit Attention condition is pending for the initiator.
- The library has experienced an unrecoverable hardware error.
- The library encounters a problem while scanning the cartridges.
- The library is not ready because a magazine is removed.

- A parameter in the CDB is invalid (see Table 4-3 for sense data).

Table 4-3 *Invalid parameters in the INITIALIZE ELEMENT STATUS CDB*

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	24h	00h	1	1	1	—	—	A reserved bit is set in the CDB. The pointers point to the bit in error.

5

INITIALIZE ELEMENT STATUS WITH RANGE (37h)

Bit Byte	7	6	5	4	3	2	1	0
00	0	0	1	1	0	1	1	1
01	Reserved						Fast	Range
02	(MSB) Starting Element Address							
03	(LSB)							
04	Reserved							
05								
06	(MSB) Number of Elements							
07	(LSB)							
08	Reserved							
09	Control							

5.1 About This Command

The INITIALIZE ELEMENT STATUS WITH RANGE command causes the library to attempt reading any bar code labels that were unreadable during the automatic cartridge inventory. The information obtained by this command can be returned to the initiator using the READ ELEMENT STATUS (B8h) command.

Notes:

- The average time required to complete this command is:
  Magnum 224 or T24—12 seconds for a single cell and 120 seconds for 24 cells.
  StorageLoader 2U—12 seconds for a single cell and 100 seconds for 20 cells.
  Magnum 448—16 seconds for a single cell and 240 seconds for 48 cells.
- For specifications for the bar code labels that can be used with the library, refer to the *Tandberg Data Bar Code Label Specification for LTO Ultrium Cartridges*.

- For best bar code scan results, refer to *Magnum 224, StorageLibrary T24, or StorageLoader 2U LTO Library Product Manual* or the *Magnum 448 LTO Library Product Manual* for information about positioning the bar code labels on data cartridges.
- Support for the INITIALIZE ELEMENT STATUS WITH RANGE command is provided for compatibility. The library automatically re-establishes the cartridge inventory immediately after power-on, whenever a magazine is inserted, or whenever the cartridge access port door is opened, then closed again. Issuing a INITIALIZE ELEMENT STATUS WITH RANGE command causes the library to attempt reading any bar code labels that were unreadable during the most current inventory operation.
- The bar code scanner cannot scan a label on a cartridge that is loaded in the tape drive.

5.2 WHAT YOU SEND TO THE LIBRARY

Fast – Byte 01, Bit 1

The library ignores this field. If a cartridge does not have a bar code label, the cartridge inventory indicates that the label is unreadable.

Range – Byte 01, Bit 0

The Range field indicates which elements are to be checked, as follows:

0	Initialize all elements
1	Initialize the range of elements specified by the Element Address and Number of Elements fields

Element Address – Bytes 02 and 03

This field specifies the address of the element or the starting address of a series of elements to be checked. This field is ignored when the Range field is 0.

- **Magnum 224, T24, or SL 2U**—"Magnum 224, T24, or SL 2U Element Addresses" on page 2-3 shows the default element addresses for the library.
- **Magnum 448**—"Magnum 448 Element Addresses" on page 2-5 shows the default element addresses for the library.

Note: When the Range field is set to 1, the specified address must be a valid element address.

Number of Elements – Bytes 06 and 07

This field indicates the maximum number of elements to be checked. This field is ignored when the Range field is 0.

If an initialize element status operation is performed on the cartridge loader, the request does not count toward the total number of elements requested in the Number of Elements field.

5.3 EFFECTS ON THE CARTRIDGE INVENTORY

The library updates the cartridge inventory whenever it is powered on, whenever a magazine is inserted, or whenever the cartridge access port door is opened, then closed again. During the inventory it checks for the presence of a cartridge at each location and scans the bar code labels. This section describes how the library updates the cartridge inventory.

Table 5-1 and Table 5-2 illustrate the various outcomes of a requested scan operation and the effect on the cartridge inventory.

- A request is made to scan a cartridge in a storage location and the scan operation completed successfully (the bar code scanner was able to read the label on the cartridge or the location was empty). See Table 5-1 for details about how the cartridge inventory is updated.

Table 5-1 *Effect on the cartridge inventory of a cartridge scan in a storage location*

This cartridge inventory field...	... is changed to the following when...	
	... the location is empty	... the location is full
Occupied	0	1
Occupied Valid	1	1
Label	blanks	cartridge label
Label Valid	0	1
Label Scan Retries	0	updated if retried
Source Storage Element Address	no change	no change

- A request is made to scan a cartridge in a storage location and the operation failed because the bar code scanner was unable to read the label on the cartridge or if the cartridge does not have a label. The scan will not fail if the location is empty. See Table 5-2 for details about how the cartridge inventory is updated.

Table 5-2 *Effect on the cartridge inventory when a request for a cartridge scan fails*

This cartridge inventory field...	...is changed to the following when the library cannot read the cartridge label
Occupied	1
Occupied Valid	1
Label	blanks
Label Valid	0

Table 5-2 *Effect on the cartridge inventory when a request for a cartridge scan fails*

This cartridge inventory field...	...is changed to the following when the library cannot read the cartridge label
Label Scan Retries	updated if retried
Source Storage Element Address	no change

5.4 COMMAND STATUS

The library returns a status byte after processing the INITIALIZE ELEMENT STATUS WITH RANGE command as follows:

Good

The library returns Good status when it is able to process the command without errors.

Busy

Busy status indicates that the library is temporarily unable to accept a command from this initiator. The initiator may retry the command later.

Reservation Conflict

The library returns Reservation Conflict status when it is reserved by a different initiator. See Chapter 20 for more information about the RESERVE command.

Check Condition

Check Condition status is returned for the following reasons:

- A Unit Attention condition is pending for the initiator.
- The library has experienced an unrecoverable hardware error.
- The library encounters a problem while scanning the cartridges.
- The library is not ready because a magazine is removed.
- A parameter in the CDB is invalid (see Table 5-3 for sense data).

Table 5-3 *Invalid parameters in the INITIALIZE ELEMENT STATUS WITH RANGE CDB*

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	24h	00h	1	1	1	—	—	A reserved bit is set in the CDB. The pointers point to the bit in error.

6

INQUIRY (12h)

Bit Byte	7	6	5	4	3	2	1	0
00	0	0	0	1	0	0	1	0
01	Reserved							EVPD
02	Page Code							
03	Reserved							
04	Allocation Length							
05	0	0	Reserved				0	0

6.1 About This Command

The INQUIRY command requests that the library send information regarding its parameters to the initiator. The library can return two categories of data in response to this command:

- Standard Inquiry Data, described starting on page 6-3, contains basic information about the library, including the product identification.
- Vital Product Data, described starting on page 6-8, contains additional detailed information about the library. Each Vital Product Data page requires a separate INQUIRY command from the initiator.

6.2 What You Send to the Library

EVPD (Enable Vital Product Data) – Byte 01, Bit 0

This bit indicates the type of inquiry data you are requesting, as follows:

0	Standard inquiry data (described on page 6-3)
1	Vital product data (described on page 6-8), based on the Page Code field (byte 02).

Page Code – Byte 02

This field contains the page number of the vital product data page to be returned for this INQUIRY command. The library supports the following page codes:

00h	Supported Vital Product Data page
80h	Unit Serial Number page
83h	Device Identification page
C0h	Original Data page
F0h	Code Level page

If the EVPD bit is set to 0, the Page Code must be 00h.

Allocation Length – Byte 04

This field specifies the number of bytes that the initiator has allocated for returned inquiry data. A value of 0 indicates that no inquiry data is to be transferred. This condition is not an error.

The library terminates the Data In phase when it has transferred either the number of bytes specified by the Allocation Length field or all of the available inquiry data, whichever is less. The lengths for inquiry data returned by the library are:

6Ch	(108) bytes for the Standard Inquiry Data
0Ah	(10) bytes for the Supported Vital Product Data page
10h	(16) bytes for the Unit Serial Number page
38h	(56) bytes for the Device Identification page
6Ch	(108) bytes for the Original Data page
60h	(96) bytes for the Code Level page

6.3 WHAT THE LIBRARY RETURNS

When the EVPD bit (byte 01, bit 0) is 0, the library returns 108 bytes of Standard Inquiry Data, as described in the following section.

6.3.1 STANDARD INQUIRY DATA PAGE

Bit / Byte	7	6	5	4	3	2	1	0
00	Peripheral Qualifier				Peripheral Device Type			
01	RMB	Reserved						
02	Version							
03	AERC	RSVD	Norm ACA	HiSup	Response Data Format			
04	Additional Length							
05	SCCS	Reserved						
06	BQue	EncServ	RSV	MultiP	MChngr	RSVD	RSVD	Addr16
07	RelAdr	RSVD	Wbus16	Sync	Linked	RSVD	Cmd Que	RSVD
08 ... 15	(MSB) Vendor Identification (LSB)							
16 ... 31	(MSB) Product Identification (LSB)							
32 ... 35	(MSB) Product Revision Level (LSB)							
36 ... 54	(MSB) Full Firmware Revision Level (LSB)							
55	Reserved							BarC
56	Reserved				Clocking		QAS	IUS
57	Reserved							
58 ... 73	Version Descriptors							

Bit Byte	7	6	5	4	3	2	1	0
74 ... 95	Reserved							
96 ... 107	(MSB) Unit Serial Number (LSB)							

Peripheral Qualifier – Byte 00, Bits 7 through 5

The value returned for this field is 0, indicating that the media changer is connected to this Logical Unit (LUN 1).

Peripheral Device Type – Byte 00, Bits 4 through 0

The value returned for this field is 08h, identifying the library as a medium changer device.

RMB (Removable Medium Bit) – Byte 01, Bit 7

The value returned for this field is 1, indicating that the media is removable.

Version – Byte 02

The value returned for this byte is 04h, indicating support of the current ANSI version of SPC-2 (SCSI Primary Commands – 2).

AERC (Asynchronous Event Reporting Capability) – Byte 03, Bit 7

This field is handled by the tape drive. Refer to the tape drive's *Product Manual* for information.

NormACA (Hierarchical Support) – Byte 03, Bit 5

This field is handled by the tape drive. Refer to the tape drive's *Product Manual* for information.

HiSup (Normal ACA Supported Bit) – Byte 03, Bit 5

This field is handled by the tape drive. Refer to the tape drive's *Product Manual* for information.

Response Data Format – Byte 03, Bits 3 through 0

This field is handled by the tape drive. Refer to the tape drive's *Product Manual* for information.

Additional Length – Byte 04

The value returned for this field is 67h, indicating that there are 67h (103) additional bytes of inquiry data available to be returned to the initiator.

SCCS (SCC Supported) – Byte 05, Bit 7

This field is handled by the tape drive. Refer to the tape drive's *Product Manual* for information.

BQue (Basic Queuing) – Byte 06, Bit 7

This field is handled by the tape drive. Refer to the tape drive's *Product Manual* for information.

EncServ (Enclosure Services) – Byte 06, Bit 6

This field is handled by the tape drive. Refer to the tape drive's *Product Manual* for information.

MultiP (Multi Port) – Byte 06, Bit 4

This field is handled by the tape drive. Refer to the tape drive's *Product Manual* for information.

MChngr (Medium Changer) – Byte 06, Bit 3

This field is handled by the tape drive. Refer to the tape drive's *Product Manual* for information.

Addr16 (SCC Supported) – Byte 06, Bit 0

This field is handled by the tape drive. Refer to the tape drive's *Product Manual* for information.

RelAdr (Relative Addressing) – Byte 07, Bit 7

This field is handled by the tape drive. Refer to the tape drive's *Product Manual* for information.

WBus16 (Wide Bus 16) – Byte 07, Bit 5

This field is handled by the tape drive. Refer to the tape drive's *Product Manual* for information.

Sync (Synchronous Transfer) – Byte 07, Bit 4

This field is handled by the tape drive. Refer to the tape drive's *Product Manual* for information.

Linked (Linked Command) – Byte 07, Bit 3

This field is handled by the tape drive. Refer to the tape drive's *Product Manual* for information.

CmdQue (Command Queuing) – Byte 07, Bit 1

This field is handled by the tape drive. Refer to the tape drive's *Product Manual* for information.

Vendor Identification – Bytes 08 through 15

The value contained in these bytes is the ASCII representation of "EXABYTE" followed by a single space.

Product Identification – Bytes 16 through 31

Note: When one of the library's emulation modes is selected from the operator panel, the library can be used with most, but not all, SCSI drivers developed for the device being emulated. The Product Identification (bytes 16 through 31) returned by the library depends on the emulation mode selected, as shown in Table 6-1 and Table 6-2.

- **Magnum 224, T24, or SL 2U**—The value contained in these bytes is the ASCII representation of the identifier, "MAGNUM_224 _ _ _ _ _ _" where each "_" represents an ASCII space character.

Table 6-1 *Magnum 224, T24, or SL 2U emulation mode product identification strings*

When you select this emulation mode...	The library returns this Product Identification string in response to an INQUIRY command...
Native (Magnum 224)	The default Product Identification stored in the library's microcode.
Exabyte 221L	"Exabyte_221L_ _ _ _" Each "_" represents an ASCII space character.
Exabyte EZ17	"Exabyte_EZ17_ _ _ _" Each "_" represents an ASCII space character.
Exabyte 210	"EXB-210_ _ _ _ _ _ _ _ _ _" Each "_" represents an ASCII space character.

- **Magnum 448**—The value contained in these bytes is the ASCII representation of the identifier, "MAGNUM_448 _ _ _ _ _ _" where each "_" represents an ASCII space character.

Table 6-2 *Magnum 448 emulation mode product identification strings*

When you select this emulation mode...	The library returns this Product Identification string in response to an INQUIRY command...
Native (Magnum 448)	The default Product Identification stored in the library's microcode.
Exabyte 221L	"Exabyte_221L_ _ _ _" Each "_" represents an ASCII space character.

Table 6-2 *Magnum 448 emulation mode product identification strings*

When you select this emulation mode...	The library returns this Product Identification string in response to an INQUIRY command...
Exabyte EZ17	"Exabyte_EZ17_ _ _ _" Each "_" represents an ASCII space character.
Exabyte 210	"EXB-210_ _ _ _ _ _ _ _ _ _" Each "_" represents an ASCII space character.

Firmware Revision Level – Bytes 32 through 35

The value contained in these bytes is the ASCII representation of the microcode revision level (for example, "C002" or other Tandberg Data microcode revisions) followed by sufficient spaces to fill the field.

Full Firmware Revision Level – Bytes 36 through 54

The value contained in these bytes is the ASCII representation of the full microcode revision level, and date (for example, "V1C002 101405").

BarC (Bar Code) – Byte 55, Bit 0

The value returned for this field is always 1, indicating that the library has a bar code scanner installed.

Clocking – Byte 56, Bits 3 through 2

This field is handled by the tape drive. Refer to the tape drive's *Product Manual* for information.

QAS (Quick Arbitration Supported) – Byte 56, Bit 1

This field is handled by the tape drive. Refer to the tape drive's *Product Manual* for information.

IUS (Information Units Supported) – Byte 56, Bit 0

This field is handled by the tape drive. Refer to the tape drive's *Product Manual* for information.

Version Descriptors – Bytes 58 through 73

Each Version Descriptor is a two byte field identifying a standard to which this device claims conformance. There are eight Version Descriptors.

Bit Byte	7	6	5	4	3	2	1	0
58	(MSB)	Version Descriptor 1 (0020h)						
59	Conforms to SAM (No version claimed)							(LSB)
60	(MSB)	Version Descriptor 2 (09E0h)						
61	Conforms to SPI-2 (No version claimed)							(LSB)

Bit / Byte	7	6	5	4	3	2	1	0
62	(MSB)	Version Descriptor 3 (0260h)						
63	Conforms to SPC-2 (No version claimed							(LSB)
64	(MSB)	Version Descriptor 4 (02E0h)						
65	Conforms to SMC (No version claimed)							(LSB)
66	(MSB)	Version Descriptor 5(0000h)						
67	Not used							(LSB)
68	(MSB)	Version Descriptor6 (0000h)						
69	Not used							(LSB)
70	(MSB)	Version Descriptor7(0000h)						
71	Not used							(LSB)
72	(MSB)	Version Descriptor8(0000h)						
73	Not used							(LSB)

Unit Serial Number – Bytes 96 through 107

The value returned for this field is the serial number for the library. The MSB is contained in byte 96. The library serial number is set at the factory.

6.3.2 SUPPORTED VITAL PRODUCT DATA PAGE (PAGE CODE 00h)

When the EVPD bit is 1 and the Page Code is 00h, the library returns the Supported Vital Product Data page as described below.

Bit / Byte	7	6	5	4	3	2	1	0
00	Peripheral Qualifier			Peripheral Device Type				
01	Page Code (00h)							
02	Reserved							
03	Page Length							
04	First Page Code Supported (00h – Supported Vital Product Data page)							
05	Second Page Code Supported (80h – Unit Serial Number page)							
06	Third Page Code Supported (83h – Device Identification page)							
07	Fourth Page Code Supported (C0h – Original Data page)							
08	Fifth Page Code Supported (F0h – Code Level page)							
09	Reserved							

Peripheral Qualifier – Byte 00, Bits 7 through 5

The value returned for this field is 0, indicating that the media changer is connected to this Logical Unit (LUN 1).

Peripheral Device Type – Byte 00, Bits 4 through 0

The value returned for this field is 08h, which identifies the library as a medium changer device.

Page Code – Byte 01

The value returned for this field is 00h, which is the Page Code for the Supported Vital Product Data page.

Page Length – Byte 03

The value returned for this field is 06h, which indicates that there are 6 bytes of data on this page (excluding this byte).

First Page Code Supported – Byte 04

The value returned for this field is 00h, which indicates support for the Supported Vital Product Data page.

Second Page Code Supported – Byte 05

The value returned for this field is 80h, which indicates support for the Unit Serial Number page.

Third Page Code Supported – Byte 06

The value returned for this field is 83h, which indicates support for the Device Identification page.

Fourth Page Code Supported – Byte 07

The value returned for this field is C0h, which indicates support for the Original Data page.

Fifth Page Code Supported – Byte 08

The value returned for this field is F0h, which indicates support for the Code Level page.

6.3.3 UNIT SERIAL NUMBER DATA PAGE (PAGE CODE 80h)

When the EVPD bit is 1 and the Page Code is 80h, the library returns the Unit Serial Number page as described below.

Bit Byte	7	6	5	4	3	2	1	0
00	Peripheral Qualifier			Peripheral Device Type				
01	Page Code (80h)							
02	Reserved							
03	Page Length (0Ch)							
04 ... 15	(MSB) Unit Serial Number (LSB)							

Peripheral Qualifier – Byte 00, Bits 7 through 5

The value returned for this field is 0, indicating that the media changer is connected to this Logical Unit (LUN 1).

Peripheral Device Type – Byte 00, Bits 4 through 0

The value returned for this field is 08h, which identifies the library as a medium changer device.

Page Code – Byte 01

The value returned for this field is 80h, which is the Page Code for the Unit Serial Number page.

Page Length – Byte 03

The value returned for this field is 0Ch, which indicates the number of remaining bytes in this page (excluding this byte).

Unit Serial Number – Bytes 04 through 15

The value returned for this field is the serial number for the library. The MSB is contained in byte 04. The library serial number is set at the factory.

6.3.4 DEVICE IDENTIFICATION PAGE (PAGE CODE 83h)

The Device Identification page allows the library to report its device identifiers, including its product identifier and serial number. The library returns the Device Identification page when the EVPD bit in the CDB is 1 and the Page Code is 83h

Bit / Byte	7	6	5	4	3	2	1	0
00	Peripheral Qualifier				Peripheral Device Type			
01	Page Code (83h)							
02	Reserved							
03	Page Length							
04	Reserved		Association		Code Set			
05	Reserved				Identifier Type			
06	Reserved							
07	Identifier Length							
08 ... 15	(MSB) Vendor Identification (LSB)							
16 ... 31	(MSB) Product Identification (LSB)							
32 ... 43	(MSB) Unit Serial Number (LSB)							
44	Reserved				Code Set - Node			
45	Reserved		Association - Node		Identifier Type - Node			
46	Reserved							
47	Identifier Length - Node (8h)							
48 ... 55	(MSB) Node Identifier (LSB)							

Peripheral Qualifier – Byte 00, Bits 7 through 5

The value returned for this field is 0, indicating that the media changer is connected to this Logical Unit (LUN 1).

Peripheral Device Type – Byte 00, Bits 4 through 0

The value returned for this field is 08h, which identifies the library as a medium changer device.

Page Code – Byte 01

The Page Code for the Device Identification Page is 83h.

Page Length – Byte 03

The Page Length for the Device Identification Page is 34h, indicating that there are 34h (52) additional bytes of inquiry data available to be returned to the initiator.

Code Set – Byte 04, Bits 3 through 0

The Code Set value is 2h, indicating that the identifier field contains ASCII data.

Identifier Type – Byte 5, Bits 3 through 0

The value returned for this field is 1h, indicating that the first eight bytes of the field contain the Vendor Identification returned for the Standard Inquiry Data.

Identifier Length – Byte 7

The value returned for this field is 24h, which indicates that the length of the Device Identifier 1 field is 36 bytes, excluding this byte.

Vendor Identification – Bytes 08 through 15

The value contained in these bytes is the ASCII representation of "EXABYTE" followed by a single space.

Product Identification – Bytes 16 through 31

- **Magnum 224, T24, or SL 2U**—The value contained in these bytes is the ASCII representation of the product i, "MAGNUM_224 _ _ _ _ _" where each "_" represents an ASCII space character.
- **Magnum 448**—The value contained in these bytes is the ASCII representation of the product i, "MAGNUM_448 _ _ _ _ _" where each "_" represents an ASCII space character.

Unit Serial Number – Bytes 32 through 43

The value returned for this field is the serial number for the library. The MSB is contained in byte 32. The library serial number is set at the factory.

Node Identification Descriptor – Byte 44 through Byte 55:

Code Set - Node – Byte 44, Bits 3 through 0. The value returned for this field is 1h, which indicates that the Node Identifier field (bytes 48 through 55) contains binary data.

Association - Node – Byte 45, Bits 5 and 4. The value returned for this field is 0h, indicating that the Node Identifier field is associated with the addressed logical unit (the node).

Identifier Type - Node – Byte 45, Bits 3 through 0. The value returned for this field is 3h, indicating that the Node Identifier field contains an FC-FS Name_Identifier.

Identifier Length - Node – Byte 47. The value returned for this field is 08h, which indicates that the length of the Node Identifier field is 8 bytes.

Node Identifier – Bytes 48 through 55 This field contains the FS-FS Node Name.

6.3.5 ORIGINAL DATA PAGE (PAGE CODE C0h)

The Original Inquiry Data page is a vendor-specific Inquiry Data page. It returns the Standard Inquiry Data for the library as it was originally specified in the microcode. The page is formatted as shown on page 6-3. All of the Standard Inquiry Data that has been changed using the MODE SELECT (15h) command (86h), or by the tape drive is replaced by the original values.

6.3.6 CODE LEVEL PAGE (PAGE CODE F0h)

The Code Level page is a vendor-specific Inquiry Data page. It provides revision level information about the following:

- The functional code currently stored in the library EEPROM. This code controls the normal operation of the library.
- The boot block code currently stored in the EEPROM. This code allows the functional code to be updated even if the code currently stored in the library is inoperable.
- The self test code currently stored in the EEPROM.
- The Ethernet code currently stored in the EEPROM.

Bit Byte	7	6	5	4	3	2	1	0
00	Peripheral Qualifier				Peripheral Device Type			
01	Page Code (F0h)							
02	Reserved							
03	Page Length (5Ch)							
04 ... 07	(MSB) Reserved (LSB)							
08	(MSB)							

Bit / Byte	7	6	5	4	3	2	1	0
...	Vendor Identification							
15								(LSB)
16	(MSB)							
...	Product Identification							
31								(LSB)
32	(MSB)							
...	Functional Code Level							
47								(LSB)
48	(MSB)							
...	Boot Block Code Level							
63								(LSB)
64								
...	Internal Self Test Code Level							
79								
80								
...	Ethernet Card Code Level							
95								

Peripheral Qualifier – Byte 00, Bits 7 through 5

The value returned for this field is 0, indicating that the media changer is connected to this Logical Unit (LUN 1).

Peripheral Device Type – Byte 00, Bits 4 through 0

The value returned for this field is 08h, which identifies the library as a medium changer device.

Page Code – Byte 01

The value returned for this field is F0h, which is the Page Code for the Code Level page.

Page Length – Byte 03

The value returned for this field is 5Ch, which indicates that there are 5Ch (92) additional bytes of data on this page (excluding this byte).

Vendor Identification – Bytes 08 through 15

The value contained in these bytes is the ASCII representation of “EXABYTE” followed by a single space.

Product Identification – Bytes 16 through 31

- **Magnum 224, T24, or SL 2U**—The value contained in these bytes is the ASCII representation of the product identifier, "MAGNUM_224 _ _ _ _ _" where each "_" represents an ASCII space character.
- **Magnum 448**—The value contained in these bytes is the ASCII representation of the product identifier, "MAGNUM_448 _ _ _ _ _" where each "_" represents an ASCII space character.

Functional Code Level – Bytes 32 through 47

The value contained in these bytes is the ASCII representation of the code level for the functional microcode and the date it was created.

Boot Block Code Level – Bytes 48 through 63

The value contained in these bytes is the ASCII representation of the code level for the boot block microcode and the date it was created.

Internal Self Test Code Level – Bytes 64 through 79

The value contained in these bytes is the ASCII representation of the code level for the internal self test microcode and the date it was created.

Ethernet Card Code Level – Bytes 64 through 79

The value contained in these bytes is the ASCII representation of the code level for the Ethernet module microcode and the date it was created.

6.4 COMMAND STATUS

The library returns a status byte after processing the INQUIRY command. This section describes when each type of status byte might be returned.

Good

The library returns Good status when it is able to process the command without errors.

Busy

The library never returns Busy status for the INQUIRY command.

Reservation Conflict

The library never returns Reservation Conflict status for the INQUIRY command.

Check Condition

The library returns Check Condition status for the following reasons:

- A reserved bit is set to 1 in the CDB.

- A parameter in the CDB is invalid (see Table 6-3 for sense data).

Table 6-3 *Invalid parameters in the INQUIRY CDB*

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	24h	00h	1	1	1	—	—	A reserved bit is set in the CDB. The pointers point to the bit in error.
5h	24h	00h	1	1	0	0	0002h	Invalid Page Code.
5h	24h	00h	1	1	1	7	0002h	Page value set but EVPD is 0.

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LOG SELECT (4Ch)

Bit Byte	7	6	5	4	3	2	1	0
00	0	1	0	0	1	1	0	0
01	Reserved						PCR	SP
02 **…** **08**	Reserved							
09	0	0	Reserved				0	0

7.1 About This Command

The LOG SELECT command allows you to reset the statistical information maintained by the library to zero. The LOG SELECT command does not transfer any parameters to the library and does not include any parameter pages.

7.2 What You Send to the Library

Byte 01, Bit 1 – PCR (Parameter Code Reset)

This field specifies whether the library should reset all of the parameters or only selected parameters, as follows:

0	Do not reset any parameters
1	Reset all of the parameters

Note: If you set the PCR bit to 1, be sure that the Parameter List Length is 0. Otherwise, the library will return Check Condition status with the sense key set to Illegal Request (5h), the ASC and ASCQ set to 24h and 00h.

SP (Saved Page) – Byte 01, Bit 0

The library does not support the saved page function. The valid value for this field is 0.

7.3 COMMAND STATUS

The library returns a status byte after processing the LOG SENSE command. This section describes when each type of status byte might be returned.

Good

The library returns Good status when it is able to process the command without errors.

Busy

Busy status indicates that the library is temporarily unable to accept a command from this initiator. The initiator may retry the command later.

Reservation Conflict

The library returns Reservation Conflict status when it is reserved by a different initiator. See Chapter 20 for more information about the RESERVE command.

Check Condition

The library returns Check Condition status for the following reasons:

- The command is issued to an invalid LUN.
- A Unit Attention condition is pending for the initiator.
- A reserved bit is set to 1 in the CDB.
- A parameter in the CDB is invalid (see Table 7-1 for sense data).

Table 7-1 *Invalid parameters in the LOG SENSE CDB*

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	24h	00h	1	1	1	—	—	A reserved bit is set in the CDB. The pointers point to the bit in error.

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LOG SENSE (4Dh)

Bit Byte	7	6	5	4	3	2	1	0
00	0	1	0	0	1	1	0	1
01	Reserved						PPC	SP
02	PC		Page Code					
03	Reserved							
04								
05	(MSB) Parameter Pointer							
06								(LSB)
07	(MSB) Allocation Length							
08								(LSB)
09	Reserved							

8.1 About This Command

The LOG SENSE command provides a means for the initiator to retrieve statistics and information on the state of the library. By using this command, you can receive the following information:

- Statistics (for example: retry counts, number of picks and places)
- State of the library hardware
- Element statistics
- Cartridge scan retries
- Element position information
- Last command failure information

8.2 WHAT YOU SEND TO THE LIBRARY

PPC (Parameter Pointer Control) – Byte 01, Bit 1

The value for the PPC field must be 0. This directs the library to return the number of bytes that you specify in the Allocation Length field, beginning with the parameter code specified in the Parameter Pointer field (bytes 05 and 06). The library returns the bytes in ascending order of parameter codes from the specified log page. When both the PPC bit and the Parameter Pointer field are set to 0 and the Allocation Length is sufficient, the library returns all available log parameters for the specified log page to the initiator.

SP (Saved Parameters) – Byte 01, Bit 0

The value for this field must be 0, indicating that the library will perform the LOG SENSE command and will not save log parameters.

PC (Page Control) – Byte 02, Bits 6 and 7

This field is always ignored and treated as if it contained the value 01h. This indicates that the library will always return the cumulative values for any log parameter requested. The library does not support any threshold values or default cumulative values.

Page Code – Byte 02, Bits 0 through 5

The Page Code field allows you to identify the page that you want the library to return. The value for this field must be one of the values specified in Table 8-1; otherwise, the library terminates the command with Check Condition status and sets the sense key to Illegal Request with the ASC set to Invalid Field in CDB.

Table 8-1 *Valid values for the Page Code field*

Page Code	Page Name	Description
00h	Supported Log Pages	Returns a list of supported log pages.
2Eh	TapeAlert	Returns information from the library's internal TapeAlert microcode. This microcode constantly monitors the library for errors and potential difficulties. When a problem is detected, the library sets a flag on this page to identify the type of problem detected.
30h	System Statistics	Returns system statistics and retry counts.
33h	Element Statistics	Returns element statistics and retry counts.
34h	Scan Retry	Returns the number of times the library had to retry scanning the cartridge at the specified element address.
36h	Environment	Returns environmental statistics
37h	Command Failure	Returns information on last command failures

Parameter Pointer – Bytes 05 and 06

The Parameter Pointer field allows you to request parameter data by specifying any of the following types of values.

- **A log parameter code.** When you are requesting the Tape Alert page, System Statistics Log page or the Environment page, specify a log parameter code. The library returns the parameter data for that code and all other codes in ascending order until the value specified in the Allocation Length field has been reached or until it completes sending parameter data for the highest code.

Example If you specify 02h for this field in the System Statistics page, the library returns statistics Total Number of Put Retries, Total Number of Scans, and so on, until there are no more statistics or the Allocation Length is exhausted.

- **An element address value.** When you are requesting the Element Statistics Log page, or the Scan Retries page, specify an element address value. The library returns the parameter data for that element and all other elements in ascending element address order until the value specified in the Allocation Length field has been reached or until it completes sending parameter data for the element with the highest element address.

Example If you specify 02h for this field (assuming the element addresses have not been changed), and the Allocation Length is long enough, the library returns the following statistics. See "Element Addresses" on page 2-3 for important addressing information.

Library	Element Type	Default Element Address
Magnum 224, T24, or SL 2U	Storage elements	See "Magnum 224, T24, or SL 2U Element Addresses" on page 2-3.
	Tape drive(s)	top half height–52h bottom half height–51h
		full height–51h
	Cartridge handling mechanism	61h
	I/E port[a]	71h
Magnum 448	Storage elements	See "Magnum 448 Element Addresses" on page 2-5.
	Tape drive(s)	top half height–54h third half height–53h second half height–52h bottom half height–51h
		top full height–52h bottom full height–51h
	Cartridge handling mechanism	61h
	I/E port[a]	top I/E port–72h bottom I/E port–71h

[a] If enabled.

Notes:

- When the Parameter Pointer is 0, the library returns all available log parameters for the specified log page (up to the specified Allocation Length).
- When the Page Code field is set to 00h, the Parameter Pointer field must also be set to 0, indicating that you are requesting the Supported Log Page (00h), which lists all log pages.
- Element addresses may have been changed with the MODE SELECT command.

Allocation Length – Bytes 07 and 08

The Allocation Length field allows you to determine the maximum amount of data to be transferred from the library to the initiator. If you specify an allocation length that is greater than the bytes available, the library terminates the Data In phase when all bytes have been transferred. You can specify 0FFFEh to include all available data.

8.3 WHAT THE LIBRARY RETURNS

This section describes the log page structure and the log pages that the library supports. The LOG SENSE command returns a single log page specified in the Page Code field of the CDB. Each log page begins with a four-byte page header (bytes 00 through 03), followed by zero or more variable-length log parameters defined for that page.

Bit / Byte	7	6	5	4	3	2	1	0
00	Reserved		Page Code					
01	Reserved							
02	(MSB) Page Length							
03	Page Length (LSB)							
04	Log Parameter (First)							
...	...							
n	Log Parameter (Last)							

Page Code – Byte 00, Bits 0 through 5

The Page Code field identifies which log page is being transferred. This field contains one of the codes described in Table 8-1.

Page Length – Bytes 02 and 03

The Page Length field specifies the length, in bytes, of the following Log Parameters. The value returned for this field depends on the value you specified for the Page Code and the Parameter Pointer in the CDB. This value is independent of what you specified for the Allocation Length.

Log Parameters – Bytes 04 through *n*

Log parameters are data structures that are contained in log pages and can be one of the following:

- Data counters that record a count of a particular event
- A numeric value indicating the state of the library hardware
- A string that contains the library event history

The general format of a log parameter is shown on the following section.

8.3.1 LOG PARAMETER FORMAT

Each log parameter begins with a four-byte header followed by one or more bytes of parameter value data.

Bit / Byte	7	6	5	4	3	2	1	0
00	(MSB)							
01				Parameter Code				(LSB)
02	DU	DS	TSD	ETC	TMC		RSVD	LP
03	Parameter Length							
04	(MSB)							
...				Parameter Value				
n								(LSB)

Parameter Code – Bytes 00 and 01

The Parameter Code field identifies which log parameter is being transferred for that log page. The valid values for this field depend on the type of log page the library is returning, as described later in this chapter.

Parameter Control (DU, DS, TSD, ETC, TMC, LP) – Byte 02

The Parameter Control field consists of the following bits:

DU – Disable Update This bit indicates that the library updates the log parameter value to reflect all events that should be recorded by that parameter. This bit is always 0.

DS – Disable Save This bit indicates that the library does not support saving for that log parameter. This bit is always 1.

TSD - Target Save Disable This bit indicates that the library provides a self-defined method for saving log parameters. This bit is always 0.

ETC – Enable Threshold Comparison This bit indicates a comparison to the threshold value is not performed whenever the cumulative value is updated. This bit is always 0.

TMC – Threshold Met Criteria This field defines the basis for comparison of the cumulative and threshold values. This field is always 0.

LP – List Parameter The List Parameter bit indicates the format of the log parameter:

0	The parameter is a data counter
1	The parameter is a list parameter

Parameter Length – Byte 03

The Parameter Length field specifies the length in bytes of the following Parameter Value field (bytes 04 through *n*).

Parameter Value – Bytes 04 through *n*

The following sections describe all log parameters that the library supports.

8.3.2 SUPPORTED LOG PAGES (PAGE CODE 00h)

The Supported Log Pages page lists all log pages that the library supports. The format for this log page is shown below.

Bit / Byte	7	6	5	4	3	2	1	0
00	Reserved		Page Code (00h)					
01	Reserved							
02	(MSB) Page Length (7h)							
03	Page Length (7h) (LSB)							
04	Supported Log Page (00h)							
05	Tape Alert Page (2Eh)							
06	System Statistics Page (30h)							
07	Element Status Page (33h)							
08	Scan Retry Page (34h)							
09	Environmental Page (36h)							
10	Command Failure Page (37h)							

8.3.3 TAPE ALERT PAGE (PAGE CODE 2Eh)

When you issue a LOG SENSE command and request the TapeAlert page, the library returns the Tape Alert parameter codes listed in Table 8-2. Each TapeAlert flag includes four bytes of descriptive information (see page 7), followed by a one-byte parameter value for the flag. Bit 0 of the parameter value contains the value for the flag, as follows:

0	The flag is not currently set
1	The flag is currently set

The remaining 7 bits of the flag are not used.

Notes:

- Issuing a LOG SENSE command to return the TapeAlert page resets all of the flags to 0. The flags are also reset whenever the library is reset or when the condition indicated by the flag is corrected. Undefined flags are always set to 0.
- Although the library only supports the TapeAlert flags listed in Table 8-2, it returns all 64 flags defined in the TapeAlert standard. Unused flags are set to 0.

Table 8-2 *Parameters returned for the LOG SENSE TapeAlert page*

Parameter Code	Flag Name	Type[a]	Description and Corrective Action
01h	Hardware A	C	The library mechanism is having difficulty communicating with the tape drive. 1. Inspect the library to make sure all cable and power connections are secure and tapes inserted correctly. 2. Turn the library off then on. 3. Restart the operation. 4. If the problem persists, contact Technical Support (see page iii) or your service provider.
02h	Hardware B	W	There is a problem with the library mechanism. 1. Inspect the library to make sure all connections are secure and tapes inserted correctly. 2. If the problem persists, contact Technical Support (see page iii) or your service provider.
03h	Hardware C	C	The library has a hardware fault: 1. Reset the library. See page 4 for instructions. 2. Restart the operation. 3. If the problem persists, contact Technical Support (see page iii) or your service provider.
04h	Hardware D	C	The library has a hardware fault. 1. Inspect the library to make sure all cable and power connections are secure and tapes inserted correctly. 2. Turn the library off then on. 3. Restart the operation. 4. If the problem persists, contact Technical Support (see page iii) or your service provider.
06h	Library Interface	C	The library has a problem with the host interface. 1. Inspect the library to make sure all connections are secure and tapes inserted correctly. 2. Restart the operation. 3. If the problem persists, contact Technical Support (see page iii) or your service provider.

Table 8-2 *Parameters returned for the LOG SENSE TapeAlert page (continued)*

Parameter Code	Flag Name	Type[a]	Description and Corrective Action
0Dh	Library Pick Retry	W	There is a potential problem with a drive ejecting cartridges short or with the library mechanism picking a cartridge from a cell. This warning is for information purposes only. No action needs to be taken at this time. 1. Inspect the library to see if any visible problems exist. 2. Insert a cartridge and try the operation again. 3. If the problem persists, contact Technical Support (see page iii) or your service provider.
0Eh	Library Place Retry	W	There is a potential problem with the library mechanism placing a cartridge into a cell. This warning is for information purposes only. This warning is for information purposes only. No action needs to be taken at this time. 1. Inspect the library to see if any visible problems exist. 2. Insert a cartridge and try the operation again. If the problem persists, contact Technical Support (see page iii) or your service provider.
0Fh	Drive Load Retry	W	There is a potential problem with the robot or drive when placing a cartridge into a drive. This warning is for information purposes only. No action needs to be taken at this time. 1. Inspect the cartridge to verify compatibility. 2. If the problem persists, contact Technical Support (see page iii) or your service provider.
10h	Library Door	I	The operation has failed because the cartridge access port door is open. 1. Clear any obstructions from the cartridge access port door. 2. Close the cartridge access port door. 3. If the problem persists, contact Technical Support (see page iii) or your service provider. This flag is cleared when the cartridge access port door is closed.
14h	Library Security Mode	I	The security mode of the library has been changed. The library has either been put into secure mode or taken out of secure mode. This is for information only. No action is required.
15h	Library Offline	I	The library has been taken offline or powered off and is unavailable for use.
16h	Library Drive Offline	I	The tape drive inside the library has been taken offline. This is for information purposes only. No action is required.
17h	Library Scan Retry	I	There is a potential problem with the bar code label or the scanner hardware in the cartridge loader. This flag is cleared when the next move command is received.

Table 8-2 *Parameters returned for the LOG SENSE TapeAlert page (continued)*

Parameter Code	Flag Name	Type[a]	Description and Corrective Action
18h	Library Inventory	C	The library has detected an inconsistency in the cartridge inventory. 1. Use the operator panel or issue a INITIALIZE ELEMENT STATUS command to update the cartridge inventory to correct the inconsistency. 2. Restart the operation.
19h	Library Illegal Operation	W	A library operation has been attempted that is invalid at this time.

[a] I = Informational suggestion to user.
W = Warning. Remedial action is advised. Performance of data may be at risk.
C = Critical. Immediate remedial action is required.

8.3.4 SYSTEM STATISTICS PAGE (PAGE CODE 30h)

The System Statistics Log page includes four bytes of descriptive information (see page 6) and returns the cumulative library system statistics stored in nonvolatile RAM shown Table 8-3. These values are not reset after power cycles or resets

Table 8-3 *System Statistics (saved in NVRAM)*

Log Parameter Function	Log Parameter Code	Parameter Control Byte						Parameter Length
		DU	DS	TSD	ETC	TMC	LP	
Total Number of Moves	0	0	1	0	0	0	0	4
Total Number of Pick Retries	1	0	1	0	0	0	0	4
Total Number of Put Retries	2	0	1	0	0	0	0	4
Total Number of Scans	3	0	1	0	0	0	0	4
Total Number of Scan Retries	4	0	1	0	0	0	0	4
Total Number of Scan Failures	5	0	1	0	0	0	0	4
Reserved	6	Reserved						4
Reserved	7	Reserved						2
Reserved	8	Reserved						2
Service Required (bit 0)	9	0	1	0	0	0	0	2
Total Drive Load Retries	10 (0Ah)	0	1	0	0	0	0	4

8.3.5 ELEMENT STATISTICS PAGE (PAGE CODE 33h)

The Element Statistics page returns cumulative statistics, such as the total number of puts to the element, the total number of times the library had to retry a put operation to the element, and the total number of times the library had to retry a pick operation to the element. These values are stored in nonvolatile RAM for each element.

The value that you specify for the Parameter Pointer field of the CDB (bytes 05 and 06) determines the value that the library returns in the Parameter Code field of the Element Statistics page. This value specifies the first element (starting Element Address) for which information is returned.

An Element Statistics page is returned for all subsequent elements (in ascending element address order) until the allocation length specified in the CDB has been reached or all element information has been sent. Element addresses can be changed with the MODE SELECT command.

Note: The Parameter Pointer specified in the CDB indicates the starting element address and must be a valid element address for the library.

Bit Byte	7	6	5	4	3	2	1	0
00	(MSB)			Parameter Code (Element Address)				
01								(LSB)
02	0	1	0	0	0	0	0	0
03	Parameter Length (8h)							
04 ... 07	Total Puts							
08	Total Put Retries							
09								
10	Total Pick Retries							
11								

Parameter Code – Bytes 00 and 01

The Parameter Code field indicates the element address for which statistical information is being provided. The element address may have been set by the MODE SELECT command.

Parameter Length – Byte 03

The Parameter Length field indicates the number of bytes that follow this field on the Element Statistics page.

Total Puts – Bytes 04 through 07

The Total Puts field indicates the total number of puts to the element location indicated by the element address. The total number of puts is stored in volatile memory. This value cannot be cleared by a LOG SELECT command with the Parameter Code Reset bit set.

Total Put Retries – Bytes 08 and 09

The Total Put Retries field indicates the total number of times the library had to retry a put operation to the element indicated by the element address. The total number of put retries is stored in nonvolatile memory. This value cannot be cleared by a LOG SELECT command with the Parameter Code Reset bit set.

Total Pick Retries – Bytes 10 and 11

The Total Pick Retries field indicates the number of times the library had to retry a pick operation from the element indicated by the element address. The total number of pick retries is stored in nonvolatile memory. This value cannot be cleared by a LOG SELECT command with the Parameter Code Reset bit set.

8.3.6 CARTRIDGE SCAN RETRIES PAGE (PAGE CODE 34h)

The Cartridge Scan Retries page returns the total number of times the library had to retry scanning the cartridge located in the element. This value is stored in volatile memory for each cartridge and is reset whenever the library is reset, powered-on, or the door is opened. This value can also be cleared by a LOG SELECT command with the Parameter Code Reset bit set.

The value that you specify for the Parameter Pointer field of the CDB (bytes 05 and 06) determines the value that the library returns in the Parameter Code field of the Cartridge Scan Retries page. This value specifies the first element (starting Element Address) for which information is returned.

A Cartridge Scan Retries page is returned for all subsequent elements (in ascending element address order) until the allocation length specified in the CDB has been reached or all element information has been sent. Element addresses can be changed with the MODE SELECT command.

Bit Byte	7	6	5	4	3	2	1	0
00	(MSB)			Parameter Code (Element Address)				
01								(LSB)
02	0	1	0	0	0	0	0	0
03	Parameter Length (2h)							
04	Total Scan Retries							
05								

Parameter Code – Bytes 00 and 01

The Parameter Code field indicates the element address for which statistical information is being provided. The element address is set by the MODE SELECT command.

Parameter Length – Byte 03

The Parameter Length field indicates the number of bytes that follow this field on the Cartridge Scan Retries page.

Total Scan Retries – Bytes 04 and 05

The Total Scan Retries field indicates the total number of times the library had to retry scanning the cartridge that is now located in the element indicated by the element address. Scan retries move with the cartridge and are reset each time the library is reset, powered-on, or when the cartridge access port door is opened.

8.3.7 ENVIRONMENTAL PAGE (PAGE CODE 36h)

The Environmental page returns values describing the environment of the library.

Bit Byte	7	6	5	4	3	2	1	0
00	(MSB)			Parameter Code				
01								(LSB)
02	0	1	0	0	0	0	0	0
03	Parameter Length (1h)							
04	Parameter Value							

Parameter Code – Bytes 00 and 01

The Parameter Code field indicates the environmental parameter for which statistical information is being provided.

Parameter Length – Byte 03

The Parameter Length field indicates the number of bytes that follow this field on the Environmental page.

Parameter Value – Byte 04

Table 8-4 lists the environmental parameters returned on the Environmental page.

Table 8-4 *Parameter codes returned on the LOG SENSE Environmental page*

Parameter Code	Name	Description	Size (Bytes)
8000h	Current Temperature	Current device temperature (degrees Celsius)	1
8001h	Max Temperature	Maximum device temperature this power on (degrees Celsius)	1
8002h	Lifetime Max Temperature	Maximum device temperature for lifetime of drive (degrees Celsius)	1
8003h	Minimum Temperature	Minimum device temperature this power on (degrees Celsius)	1
8004h	Lifetime Minimum Temperature	Minimum device temperature for lifetime of drive (degrees Celsius)	1
8005h	Power Cycles	Number of time device has been powered on	4
8004h	Lifetime Minutes Powered On	Number of minutes the device has been powered on	4

8.3.8 COMMAND FAILURE PAGE (PAGE CODE 37h)

The Command Failure page returns values describing the most recently failed motion command that was issued to the library.

Bit Byte	7	6	5	4	3	2	1	0
00	(MSB)							
01	Parameter Code							(LSB)
02	0	1	0	0	0	0	0	0
03	Parameter Length (8h)							
04	Command							
05	Fault Symptom Code							
06	Command Interface							
07	Physical Element Address							
08	(MSB)							
...	Total Power On Minutes							
11								(LSB)

Parameter Code – Bytes 00 and 01

The Parameter Code field indicates the which command the information on the Command Failure Code page describes. Table 8-5 lists the valid values for the Parameter Code field.

Table 8-5 *Parameter codes returned on the LOG SENSE Command Failure page*

Parameter Code	Name	Description	Size (Bytes)
8000h	Nth Command Failure	Information on last command failure	8
8001h	N-1 Command failure	Information on next to last command failure	8
8002h	N-2 Command Failure	Information on second to last command failure	8
8003h	N-3 Command Failure	Information on third to last command failure	8

Parameter Length – Byte 03

The Parameter Length field indicates the number of bytes that follow this field on the Command Failure Code page.

Command – Byte 04

The Command field indicates name of the failed command. Table 8-6 lists the valid values for the Command field.

Table 8-6 *Command codes returned on the LOG SENSE Command Failure page*

Command Code	Name	Description
00h	None	No command
01h	Initialize	Initialize System
02h	Abort	Abort current command
03h	Self Test	Execute Self Test
04h	Update Inventory	Update tape inventory
05h	Position To Element	Position robot to element
06h	Move Medium	Move medium from one element to another
07h	Unlock I/E Port	Unlock I/E port for user access
08h	Unlock Magazine	Unlock Magazine for user access
09h	Clean Drive	Load Cleaning Cartridge, Clean, Unload Cartridge
0Ah	Park Robot	Park Robot for insertion of shipping tab

Fault Symptom Code – Byte 05

The Fault Symptom Code field specifies the reason for the most recent Check Condition status. Table 8-7 lists the valid values for the Fault Symptom Code field.

Table 8-7 *Fault Symptom Codes returned on the LOG SENSE Command Failure page*

Fault Symptom Code	Description
00h	Success (synchronous)
01h	Success (asynchronous)
02h	Service is busy
03h	Operation stopped
04h	Operation aborted
05h	Software error
06h	System error
07h	General hardware failure
08h	SCSI DMA transfer failed
09h	Servo failure
0Ah	Not implemented
0Bh	System time out
0Ch	General failure
0Dh	Drive time out
0Eh	Servo time out
0Fh	SCSI time out
10h	Command parameter error
11h	SCSI parity error
12h	Device is not ready
13h	Drive is too hot
14h	TapeAlert exception
15h	Microcode for download is bad
16h	A Unit Attention Condition exists
17h	Medium removal disallowed
18h	Drive full
19h	Drive empty
1Ah	Drive command error

Table 8-7 *Fault Symptom Codes returned on the LOG SENSE Command Failure page (continued)*

Fault Symptom Code	Description
1Bh	Drive communication error
1Ch	Cell full
1Dh	Cell empty
1Eh	Drive load failed
1Fh	Drive unload failed
20h	Device Services owned by panel
21h	Device Services owned by E-Net interface
22h	Picker indicates shipping lock in place
23h	Drive interface version not compatible
24h	Cartridge misloaded
25h	Invalid cartridge type
26h	Servo jammed
27h	Servo unsafe
28h	I/E port unlocked
29h	Magazine unlocked
2Ah	Robot full
2Bh	In sequential mode
2Ch	Cable check failed
2Dh	Robot empty
2Eh	Library overflow (too many cartridges)
2Fh	Mechanical calibration is incomplete

Command Interface – Byte 06

The Command Interface field indicates the source of the failed command. Table 8-8 lists the valid values for the Command Interface field.

Table 8-8 *Command Interface codes returned on the LOG SENSE Command Failure page*

Command Interface Code	Description
00h	None
01h	SCSI Command

Table 8-8 *Command Interface codes returned on the LOG SENSE Command Failure page*

Command Interface Code	Description
02h	Panel Command
03h	Ethernet Command

8.4 COMMAND STATUS

The library returns a status byte after processing the LOG SENSE command. This section describes when each type of status byte might be returned.

Good

The library returns Good status when it is able to process the command without errors.

Busy

Busy status indicates that the library is temporarily unable to accept a command from this initiator. The initiator may retry the command later.

Reservation Conflict

The library returns Reservation Conflict status when it is reserved by a different initiator. See Chapter 20 for more information about the RESERVE command.

Check Condition

The library returns Check Condition status for the following reasons:

- The command is issued to an invalid LUN.
- A Unit Attention condition is pending for the initiator.
- A reserved bit is set to 1 in the CDB.
- A parameter in the CDB is invalid (see Table 8-9 for sense data).

Table 8-9 *Invalid parameters in the LOG SENSE CDB*

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	24h	00h	1	1	1	—	—	A reserved bit is set in the CDB. The pointers point to the bit in error.
5h	24h	00h	1	1	1	0	0000h	The SP field is incorrect. It must be set to 00b.
5h	24h	00h	1	1	1	1	0001h	The PPC field is incorrect. It must be set to 00b.

Table 8-9 *Invalid parameters in the LOG SENSE CDB (continued)*

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	24h	00h	1	1	1	7	0002h	The PC field is incorrect. It must be set to 01b.
5h	24h	00h	1	1	1	5	0002h	Invalid Page Code.
5h	24h	0h	1	1	0	0	0005h	Invalid parameter pointer.

Notes

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MODE SELECT (15h)

Bit Byte	7	6	5	4	3	2	1	0
00	0	0	0	1	0	1	0	1
01	Reserved			PF	Reserved			SP
02	Reserved							
03								
04	Parameter List Length							
05	0	0	Reserved				0	0

9.1 About This Command

The MODE SELECT command enables you to specify operating parameters for the library. These parameters configure the library upon power-up or a reset condition. You provide the parameters in a parameter list that can include the following:

- 4 bytes for the Parameter List Header (required)
- 20 bytes for the Element Address Assignment page
- 6 bytes for the Unique Properties page
- 36 bytes for the LCD Mode page
- 4 bytes for the Cleaning Configuration page

! Important The values sent to the library apply to all initiators in a multi-initiator environment. If an initiator issues a MODE SELECT command that changes any current or saved operating parameters, the library returns a Check Condition status with a sense key of Unit Attention (6h) and an ASC and ASCQ of Mode Parameters Changed (2Ah and 01h, respectively) to all other initiators that issue a request to the library.

Notes:

- Before issuing any MODE SELECT commands, issue a MODE SENSE (1Ah) command with the PC field set to 1h and the Page Code field set to 3Fh to determine which pages of mode parameters are supported, which parameters within the pages are changeable, and the supported length of each page. See Chapter 10 for more information about the MODE SENSE command.
- When you issue a MODE SELECT command, the parameters are not changed until the library has verified that the new values are valid. If any value is not valid, the library returns the appropriate error (see Section 9.3) and does not change the MODE SELECT parameters.

9.2 WHAT YOU SEND TO THE LIBRARY

PF (Page Format) – Byte 01, Bit 4

This field specifies the page format used by the library. The library supports the page format specified by SPC-2. This value must be 1.

SP (Saved Page) – Byte 01, Bit 0

The library supports the saved page function. The values for this field are as follows:

0	Current configuration values are changed to the values sent to the library. Saved values stored in nonvolatile memory are not affected.
1	Current configuration values specified by this command are saved in nonvolatile memory and are used for subsequent operations.

Parameter List Length – Byte 04

This field indicates the length of the entire parameter list. The parameter list length is equal to the length of one Parameter List Header (4 bytes) plus the lengths of all pages to be transferred. Table 9-1 lists the page lengths. If no pages are to be transferred, specify 0 for the Parameter List Length field.

Note: A parameter list length of 4 is not valid. When you send the Parameter List Header, you must send at least one page with it.

Table 9-1 *MODE SELECT page lengths*

Page	Length (bytes)
Element Address Assignment Page	14h (20)
Unique Properties Page	6h (6)
LCD Mode Page	24h (36)
Cleaning Configuration Page	4h (4)

For example, if you want to transfer the LCD Mode page, set the parameter list length to 40 bytes (28h):

```
   4 bytes  (Parameter List Header length)
+ 36 bytes  (LCD Mode page length)
  40 bytes
```

If you want to transfer all of the available mode pages, set the parameter list length to 70 (46h):

```
   4 bytes  (Parameter List Header length)
  20 bytes  (Element Address Assignment Page)
   6 bytes  (Unique Properties Page)
  36 bytes  (LCD Mode Page)
+  4 bytes  (Cleaning Configuration Page)
  70 bytes
```

9.2.1 PARAMETER LIST HEADER

If you send one or more parameter pages with the MODE SELECT command, you must send a Parameter List Header. Do not send the Parameter List Header if you are not sending any parameter pages.

Bit Byte	7	6	5	4	3	2	1	0
00	Reserved							
01								
02								
03								

All fields of the Parameter List Header are reserved. You must specify a value of 0 for each field.

9.2.2 ELEMENT ADDRESS ASSIGNMENT PAGE (PAGE CODE 1Dh)

This section describes the fields for the Element Address Assignment page and the values you can specify for these fields. Refer to "Elements and Element Addresses" on page 2-2 and to "Assigning Element Addresses" on page 9-4 for an explanation of element addresses.

Assigning Element Addresses

An *element* is a way of classifying various components in the library. Element addresses reference specific physical locations in the library. All of the libraries contains these element types:

- Cartridge loader (medium transport) element
- Cartridge cells (storage) elements
- I/E port (import/export) elements
- Tape drive (data transfer) elements

Each element requires an address so that it can be identified during a SCSI command operation. The library has default addresses assigned to each element. Table 9-2 lists the default element address for the first element type in the library. See "Element Addresses" on page 2-3 for important addressing information.

Table 9-2 *Default element addresses for each element in the library*

Element	Default Starting Address
First Storage Element	1 (01h)
First Data Transfer Element	81 (51h)
First Medium Transport Element	97 (61h)
First I/E Port Element	113 (71h)

If you want to change the addresses of the library's elements, use the Element Address Assignment page. In this page, you assign a starting address for each element type (cartridge loader, cartridge cells, I/E port, and tape drive) and then specify the total number of elements of that type. Since there is only one cartridge loader, the starting address you specify for this element is the only address for that element. The element addresses for the cartridge cells are numbered consecutively, with the first address being the starting element address that you specify.

Because the library supports the saved page function, you can save the element address values by setting the SP bit in the CDB to 1. These values configure the library upon power-up or a reset condition.

! Important For the starting element addresses, you can specify any 16-bit binary number, with the following conditions:

- Element addresses must not overlap.
- Addresses within each type of element must be consecutive. The highest address you can assign for the first storage element is:
  Magnum 224 or T24–FFE8h (1111111111101000b). This causes the last storage element to be numbered 0FFFFh (1111111111111111b)
  StorageLoader 2U–FFECh (1111111111101100b). This causes the last storage element to be numbered 0FFFFh (1111111111111111b)
  Magnum 448–FFD0h (1111111111010000b). This causes the last storage element to be numbered 0FFFFh (1111111111111111b)

Bit Byte	7	6	5	4	3	2	1	0
00	Reserved		Page Code (1Dh)					
01	Page Length							
02	(MSB)		Medium Transport Element Address					
03								(LSB)
04	(MSB)		Number of Medium Transport Elements					
05								(LSB)
06	(MSB)		First Storage Element Address					
07								(LSB)
08	(MSB)		Number of Storage Elements					
09								(LSB)
10	(MSB)		First Import/Export Element Address					
11								(LSB)
12	(MSB)		Number of Import/Export Elements					
13								(LSB)
14	(MSB)		First Data Transfer Element Address					
15								(LSB)
16	(MSB)		Number of Data Transfer Elements					
17								(LSB)
18	Reserved							
19								

Page Code – Byte 00, Bits 5 through 0

This field identifies the Element Address Assignment page. The value of this field must be 1Dh.

Page Length – Byte 01

This field indicates the length, in bytes, of the Element Address Assignment parameter list. The valid value for this field is 12h (18), which indicates that there are an additional 18 bytes of parameter data that follow this byte.

Medium Transport Element Address – Bytes 02 and 03

This field identifies the address of the cartridge loader. The default value for this field is 61h (97).

Number of Medium Transport Elements – Bytes 04 and 05

This field identifies the number of cartridge loaders within the library. The library has only one cartridge loader. The valid value for this field is 1.

First Storage Element Address – Bytes 06 and 07

This field identifies the starting address of the cartridge storage locations. The default starting address is 01h (1). When assigning new addresses, you assign the first number and the library automatically assigns the others sequentially. See "Element Addresses" on page 2-3 for important addressing information.

Number of Storage Elements – Bytes 08 and 09

This field identifies the maximum number of cartridge storage locations within the library.

- **Magnum 224 or T24**—The maximum valid value for this field is 18h (24).
- **StorageLoader 2U**—The maximum valid value for this field is 14h (20).
- **Magnum 448**—The maximum valid value for this field is 30h (48).

The number of storage elements is fixed and cannot be changed using the MODE SELECT command. See the *Magnum 224, StorageLibrary T24, or StorageLoader 2U LTO Library Product Manual* or the *Magnum 448 LTO Library Product Manual* for more information about limiting the number of cells used by the library.

Notes:

- **Magnum 224 or T24**—The cleaning cell is not available to SCSI. In this case the maximum number of storage elements is 23 and the value for this field is 17h.
- **StorageLoader 2U**—The cleaning cell is not available to SCSI. In this case the maximum number of storage elements is 19 and the value for this field is 13h.
- **Magnum 448**—The cleaning cell is not available to SCSI. In this case the maximum number of storage elements is 47 and the value for this field is 2Fh.

First Import/Export Element Address – Bytes 10 and 11

This field identifies the address of the entry/exit port. See "Element Addresses" on page 2-3 for important addressing information.

- **Magnum 224, T24, or SL 2U**—The library has one I/E port. If the I/E port element is enabled, the default starting address for the I/E port element is 71h. See the *Magnum 224, StorageLibrary T24, or StorageLoader 2U LTO Library Product Manual* for instructions on enabling and disabling the I/E port.
- **Magnum 448**—The library has two physical I/E ports, but you can "enable" the library to use zero, one, or two I/E ports through the front panel. The library ships from the factory with both I/E ports enabled. See the *Magnum 448 LTO Library Product Manual* for instructions on enabling and disabling I/E ports.
  - Bottom I/E port element enabled– the default starting address for the I/E port element is 71h.
  - Both I/E port elements enabled– the default starting address for the I/E port elements are:
    Top I/E port element–72h
    Bottom I/E port element–71h

Number of Import/Export Elements – Bytes 12 and 13

This field identifies the total number of locations used for importing and exporting cartridges into and out of the library.

- **Magnum 224, T24, or SL 2U**—The library has one I/E port. The value for this field is normally 1.

0	I/E port is disabled
1	I/E port is enabled

- **Magnum 448**—The library has two physical I/E ports, but you can "enable" the library to use zero, one, or two I/E ports through the front panel. The value for this field is normally 2 (both I/E ports enabled).

0	I/E port is disabled
1	One I/E port is enabled
2	Both I/E ports are enabled

First Data Transfer Element Address – Bytes 14 and 15

This field identifies the starting address of the installed tape drives.

- **Magnum 224, T24, or SL 2U**—The library may have one or two tape drives with a default starting address of 51h (81).

- **Magnum 448**—The library may have one, two, three, or four tape drives with a default starting address of 51h (81).

Number of Data Transfer Elements – Bytes 16 and 17

This field identifies the number of tape drives installed in the library.

- **Magnum 224, T24, or SL 2U**—The library may have one or two tape drives installed. The valid value for this field is 1 or 2.
- **Magnum 448**—The library may have one, two, three, or four tape drives installed. The valid value for this field is 1, 2, 3, or 4.

Note: The actual number of tape drives installed cannot be changed by this field. The tape drive configuration must be altered through the Front Panel under the Drive Configuration menu.

9.2.3 UNIQUE PROPERTIES PAGE (PAGE CODE 21H)

The Unique Properties Page sets options that are unique to the library.

Bit / Byte	7	6	5	4	3	2	1	0
00	Reserved		Page Code (21h)					
01	Page Length (4h)							
02	(MSB) Reserved							
03	Reserved (LSB)							
04	MaxStor	Reserved	MaxStorAddr					
05	Reserved	DisIEP	DisIEP2	Reserved		Dead	Reserved	

Page Code – Byte 00, Bits 5 through 0

This field identifies the Unique Properties page. The value of this field must be 21h.

Page Length – Byte 01

This field indicates the length, in bytes, of the Unique Properties parameter list. The valid value for this field is 04h (4) which indicates that there are an additional 4 bytes of data that follow this byte.

MaxStor – Byte 4, Bit 7

This field specifies whether the number of available storage elements is limited to the value specified in the MaxStorAddr field, as follows:

0	Do not limit the number of available storage elements (use all of the cartridge cells as storage elements)
1	Limit the number of available storage elements to the value specified in the MaxStorAddr field

The factory default is 0.

The MaxStor field is directly related to the Limit Cells option available from the library's operator panel. The option to limit the number of cells can be set, cleared, or viewed using the operator panel or by issuing a MODE SELECT command with this field set to 1.

This field is kept in nonvolatile RAM, and once set, remains in effect, even between power-on cycles, until changed by this command.

MaxStorAddr – Byte 4, Bits 5 through 0

This field specifies how many storage elements the library reports and uses.

- **Magnum 224 or StorageLibrary T24**—The library may have up to 24 storage slots. Valid values for this field are 4 through 24 (18h). The factory default is 18h. The library ignores the MaxStorAddr field if the MaxStor bit is set to 0. If the MaxStorAddr field is set to 24 (18h), the library responds as if the MaxStor bit is set to 0.

- **StorageLoader 2U LTO**—The library may have up to 20 storage slots. Valid values for this field are 4 through 20 (14h). The factory default is 14h. The library ignores the MaxStorAddr field if the MaxStor bit is set to 0. If the MaxStorAddr field is set to 20 (14h), the library responds as if the MaxStor bit is set to 0.

- **Magnum 448**—The Magnum 448 LTO Library may have up to 48 storage slots. Valid values for this field are 4 through 48 (30h). The factory default is 30h. The library ignores the MaxStorAddr field if the MaxStor bit is set to 0. If the MaxStorAddr field is set to 48 (30h), the library responds as if the MaxStor bit is set to 0.

Notes:

- The MaxStorAddr is a maximum slot count that the library will use. If the count is less for any reason (I/E Port, Cleaning Slot, a blank magazine without slots) the smaller number will be used.

- The MaxStorAddr field is directly related to the Slot Count option available from the library's operator panel. When this field is set, the library only uses the number of cartridge cells specified as storage elements. The unused cells are not available for use as addressable storage elements. The number of cells can be set, cleared, or viewed using the operator panel or by issuing a MODE SELECT command with this field set to the desired number of cells.
- If both the Fixed Cleaning Cell and Auto-Clean flags are set to 1 on the Cleaning Configuration Page (see page 9-13), the cleaning cell, indicated by the MaxStorAddr field is used for the cleaning cartridge and is not accessible using SCSI commands.
- The library ignores the MaxStorAddr field if the MaxStor bit is set to 0. If the MaxStorAddr field is set to 24 (18h), 20 (14h), or 48 (30h), the library responds as if the MaxStor bit is set to 0.
- Changes to the MaxStorAddr field do not take affect until the library is reset.

DisIEP – Byte 05, Bit 6 (Disable I/E Port 1)

This field specifies whether the I/E Port is enabled or disabled.

- **Magnum 224, T24, or SL 2U**—The library has only one I/E Port (I/E Port 1).

0	I/E Port is enabled for use
1	I/E Port is disabled, the slot becomes a storage cell

  - **Enabled**—Enabling the I/E port consumes the first storage slot. If the I/E port is enabled, storage slots are numbered 01h-17h starting with the storage slot beneath the I/E port.
  - **Disabled**—If the I/E port is disabled, cell 71h does not exist and you have 24 storage slots.

- **Magnum 448**—The Magnum 448 LTO Library has two physical I/E Ports (I/E Port 1, which is the bottom element, and I/E Port 2, which is the top element). See DisIEP2 – Byte 05, Bit 6 (Disable I/E Port 2) for information about the second/top I/E port.

0	I/E Port is enabled for use
1	I/E Port is disabled, the slot becomes a storage cell

  - **Enabled**—Enabling the *bottom* I/E port consumes the first storage slot. If this I/E port is enabled, storage slots are numbered 01h-30h starting with the storage slot beneath the I/E port.
  - **Disabled**—If the *bottom* I/E port is disabled, cell 71h does not exist and you have 48 storage slots.

For additional information, see:

- Overview of elements—"Elements and Element Addresses" on page 2-2
- **Magnum 224, T24, or SL 2U** elements— "Magnum 224, T24, or SL 2U Element Addresses" on page 2-3
- **Magnum 448** elements—"Magnum 448 Element Addresses" on page 2-5

DisIEP2 – Byte 05, Bit 6 (Disable I/E Port 2)

This field specifies whether the *top* I/E Port is enabled or disabled, and applies only to the Magnum 448 LTO Library.

Magnum 448—The Magnum 448 LTO Library has two physical I/E Ports (I/E Port 1–71h, which is located in the bottom magazine, and I/E Port 2–72h, which is located in the top magazine). See DisIEP – Byte 05, Bit 6 (Disable I/E Port 1) for information about the bottom I/E port.

0	I/E Port is enabled for use
1	I/E Port is disabled, the slot becomes a storage cell

- **Enabled**—Enabling the *bottom* I/E port consumes the first storage slot. If this I/E port is enabled, storage slots are numbered 01h-30h.
  For important information about enabling *both* the bottom and top I/E ports, see "Magnum 448 Element Addresses" on page 2-5.
- **Disabled**—If the *bottom* I/E port is disabled, cell 72h does not exist and you have 48 storage slots.

Dead – Byte 05, Bit 2 (Dead Device)

This field indicates that the library requires service, as follows:

0	The library does not require service
1	The library requires service

The factory default is 0.

This bit is normally set during operation if a non-recoverable mechanism error is detected. The field is usually cleared after the problem has been resolved. The field can be set to 1 for diagnostic purposes.

This field is kept in nonvolatile RAM, and once set, remains in effect, even between power-on cycles, until changed by this command.

9.2.4 LCD MODE PAGE (PAGE CODE 22h)

Bit Byte	7	6	5	4	3	2	1	0
00	Reserved		Page Code (22h)					
01	Parameter Length (22h)							
02	RSVD	RSVD	Reserved		Write Line 1	Reserved		
03	Reserved							
04 ... 24	Display Line 1							
25 ... 35	Reserved							

Page Code – Byte 00, Bits 5 through 0

This field identifies the LCD Mode page. The value of this field must be 22h.

Parameter Length – Byte 01

This field indicates the length, in bytes, of the LCD Mode page. The valid value for this field is 22h (34), which indicates that 34 bytes of data follow this byte.

Write Line 1 – Byte 02, Bit 3

This field determines the type of text that appears on Display Line 1 of the LCD Status Screen (bytes 04 through 23 of the LCD Mode page), as follows:

0	Library's default text
1	Text you specify in bytes 04 through 19 of the LCD Mode page

Display Line 1 – Bytes 04 through 24

This field enables you to specify the text that will appear on line 1 of the LCD. Display Line 1 is typically used to specify the product name displayed on the LCD. The default product name for the library is "Magnum224" or Magnum448".

You can use up to 21 characters for this text. If you use less than 21 characters, the byte following the last character 00h.

The text specified in this field is displayed when the library is idle, showing its default screen, and no panel initiated command is active.

9.2.5 CLEANING CONFIGURATION PAGE (PAGE CODE 25h)

The Cleaning Configuration page specifies how the library behaves when it is configured to autoclean the tape drive.

Bit Byte	7	6	5	4	3	2	1	0
00	Reserved		Page Code (25h)					
01	Page Length (02h)							
02	Reserved						Auto	FixEnable
03	Reserved							

Page Code – Byte 00, Bits 5 through 0

This field identifies the Clean Configuration page. The value of this field must be 25h.

Parameter Length – Byte 01

This field indicates the length, in bytes, of the Cleaning Configuration page. The valid value for this field is 02h (2), which indicates that 2 bytes of data follow this byte.

Auto – Byte 02, Bit 1

This bit indicates whether the library will use the cleaning cartridge in the Fixed Cleaning Cartridge cell to clean the tape drive automatically when required, as follows:

0	Do not automatically clean drive
1	Automatically clean drive when required if a cleaning cartridge is available

This bit is ignored if the FixEnbl bit is 0.

FixEnbl – Byte 02, Bit 0

This bit indicates whether the library has a fixed cell reserved for a cleaning cartridge, as follows:

0	No cleaning cartridge reservation
1	Highest numbered Storage Element reserved for cleaning cartridge

When the FixEnbl is set to 1, the storage element with the highest element address is reserved for a cleaning cartridge. That storage element is then unavailable for storing a data cartridge. Refer to the *Product Manual* more information about the library's Autoclean option.

Notes:

- When both the FixEnbl and the Auto bits are set (that is, when a cell is reserved for a cleaning cartridge and the library is configured to automatically handle cleaning) the cell reserved for the cleaning cartridge, with the highest element address, is removed from the cell geometry.
- The status of reserved cell is not reported in response to the READ ELEMENT STATUS or READ ELEMENT STATUS WITH RANGE commands.
- The reserved element address is invalid for motion commands (for example, MOVE MEDIUM, POSITION TO ELEMENT).
- The handling of the element address reserved for the cleaning cartridge is unchanged on all LOG SELECT and LOG SENSE log pages.
- When a MODE SELECT command changes the values for both the FixEnbl and the Auto bits (either both turned on or both turned off), the library returns NOT READY TO READY Unit Attention (ASC/ASCQ of 28h/00h) message after the successful completion of the command.

9.3 COMMAND STATUS

The library returns a status byte after processing the MODE SELECT command. This section describes when each type of status byte might be returned.

Good

The library returns Good status when it is able to process the command without errors (that is, when the requested MODE SELECT parameters have been copied over the current MODE SELECT settings and, if requested, the saved MODE SELECT settings).

Busy

Busy status indicates that the library is temporarily unable to accept a command from this initiator. The initiator may retry the command later.

Reservation Conflict

The library returns Reservation Conflict status when it is reserved by a different initiator. See Chapter 20 for more information about the RESERVE command.

Check Condition

The library returns Check Condition status for the following reasons:

- The command is issued to an invalid LUN.
- A Unit Attention condition is pending for the initiator.
- A reserved bit is set to 1 in the CDB.
- The library detects an unrecoverable parity error while receiving the MODE SELECT data.
- A parameter in the CDB on a MODE SELECT page is invalid (see Table 9-3 for sense data).

Table 9-3 *Invalid parameters in the MODE SELECT CDB and mode data*

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	1Ah	00h	1	1	0	0	0004h	Invalid Parameter List Length.
5h	21h	01h	1	0	0	0	[a]	Address overlap. The field pointer is set to the value representing the field in the Element Address Assignment page which caused the address overlap, as follows: ▪ 0006h – Medium Transport Element Address ▪ 000Ah – Storage Element Address
5h	24h	00h	1	1	1	—	—	A reserved bit is set in the CDB. The pointers point to the bit in error.
5h	24h	00h	1	1	1	4h	0001h	Invalid PF (page format). Must be 1.
5h	26h	00h	1	0	0	0	[a]	Invalid values in the Parameter List Header. All values must be 0. The value of the field pointer is the value of the first field that contains a non-zero value (00, 01, 02, or 03)
5h	26h	00h	1	0	1	5h	[a]	Invalid Page Code.
5h	26h	00h	1	0	1	7h	[a]	Reserved bits set in the first byte of one of the MODE SELECT pages.
5h	26h	00h	1	0	0	0	[a]	Invalid Parameter Length.
5h	26h	00h	1	0	0	0	[a]	Reserved bits set in the reserved fields 22 or 23 (bytes 18 or 19 of the Element Address Assignment page).
5h	26h	00h	1	0	0	0	[a]	Invalid first import/export address.
5h	26h	00h	1	0	0	0	[a]	Storage element addresses are not consecutive.
5h	26h	00h	1	0	0	0	[a]	Data transfer element addresses are not consecutive.

Table 9-3 *Invalid parameters in the MODE SELECT CDB and mode data (continued)*

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	26h	02h	1	0	0	0	[a]	Address wrap. Number of elements causes the address range to wrap back to 0000.
5h	26h	02h	1	0	0	0	[a]	Invalid number of transport elements.
5h	26h	02h	1	0	0	0	[a]	Invalid number of storage elements.
5h	26h	02h	1	0	0	0	[a]	Invalid number of import/export elements.
5h	26h	02h	1	0	0	0	[a]	Invalid number of data transfer elements.

[a] Field pointer depends on the order in which the pages are sent.

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MODE SENSE (1Ah)

Bit Byte	7	6	5	4	3	2	1	0
00	0	0	0	1	1	0	1	0
01	Reserved				DBD	Reserved		
02	PC		Page Code					
03	Reserved							
04	Allocation Length							
05	Reserved							

10.1 About This Command

The MODE SENSE command enables the library to report its operating mode parameters to the initiator. The initiator can request one or all pages of mode parameters. Each response includes four bytes for the Parameter List Header, followed by the specified number of bytes for each page:

- 20 bytes for the Element Address Assignment page
- 4 bytes for the Transport Geometry Descriptor page
- 20 bytes for the Device Capabilities page
- 6 bytes for the Unique Properties page
- 36 bytes for the LCD Mode page
- 4 bytes for the Cleaning Configuration page
- 4 bytes for the Operating Mode page

Using the MODE SELECT (15h) command, you can change the values of all of these parameters, except the Transport Geometry Descriptor page, the Device Capabilities page, and the Operating Mode page.

10.2 WHAT YOU SEND TO THE LIBRARY

DBD (Disable Block Descriptors) – Byte 01, Bit 3

The library ignores this bit.

PC (Page Control) – Byte 02, Bits 7 and 6

This field defines the type of parameters that are to be returned for the MODE SENSE command. Specify one of the following values:

0 (00b) – Current values Indicates that the library should return the current parameter values. The current values returned are:

- The parameters set in the last successful MODE SELECT command.
- The saved values, if a MODE SELECT command has not been executed since the last power-on or reset.
- The default values, if saved values are not available.

1 (01b) – Changeable values Indicates that the library should return the changeable parameter masks. The pages you request are returned and indicate which parameters you can change. All bits of parameters that you can change are set to 1. All bits of parameters that you cannot change are set to 0. The Page Code and Parameter List Length fields contain actual values.

Note: Before issuing a MODE SELECT command, issue a MODE SENSE command with the PC field set to 1 and the Page Code field set to 3Fh. This will allow you to determine the supported pages, the changeable parameters within the pages, and the supported length of each page.

2 (10b) – Default values Indicates that the library should return the default values. The pages you request are returned, with each supported parameter set to its default value. Parameters not supported by the library are set to 0.

3 (11b) – Saved values Indicates that the library should return the saved values. The pages you request are returned, with each supported parameter set to its saved value. Parameters not supported by the library are set to 0.

Note: For a PC value of 3, if no page has been saved, the library returns default values.

Page Code – Byte 02, Bits 5 through 0

This field allows you to specify which page the library should return. Specify one of the following values:

1Dh	Element Address Assignment page
1Eh	Transport Geometry Descriptor page
1Fh	Device Capabilities page
21h	Unique Properties page
22h	LCD Mode page
25h	Cleaning Configuration Page
26h	Operating Mode Page
3Fh	All pages (in the above order)

Allocation Length – Byte 04

This field allows you to specify the length of the parameter list the library will return. The maximum length you need to specify to receive all pages is 98 (62h) bytes. The library terminates the data in phase when the number of bytes specified by the Allocation Length have been transferred or when all available MODE SENSE data have been transferred to the initiator, whichever is less.

10.3 WHAT THE LIBRARY RETURNS

This section describes the mode data page structure and the pages that the library supports. The MODE SENSE command returns the single mode data page specified in the Page Code field of the CDB. Each mode data page begins with a four-byte parameter list header, followed by zero or more variable-length mode data parameters defined for the specified page.

10.3.1 PARAMETER LIST HEADER

Bit Byte	7	6	5	4	3	2	1	0
00	Mode Data Length							
01	Reserved							
02								
03								

Mode Data Length – Byte 00

This field indicates the number of bytes of parameter information the library is returning as a result of this command, excluding the Mode Data Length byte, but including the three additional Parameter List Header bytes.

10.3.2 ELEMENT ADDRESS ASSIGNMENT PAGE (PAGE CODE 1Dh)

For the element-specific field definitions in the following list, refer to:

- **Magnum 224, T24, or SL 2U**—"Magnum 224, T24, or SL 2U Element Addresses" on page 2-3
- **Magnum 448**— "Magnum 448 Element Addresses" on page 2-5
- General information—Chapter 9.

Bit Byte	7	6	5	4	3	2	1	0
00	PS	RSVD	Page Code (1Dh)					
01	Parameter Length (12h)							
02	(MSB)	Medium Transport Element Address						
03	Medium Transport Element Address							(LSB)
04	(MSB)	Number of Medium Transport Elements						
05	Number of Medium Transport Elements							(LSB)
06	(MSB)	First Storage Element Address						
07	First Storage Element Address							(LSB)
08	(MSB)	Number of Storage Elements						
09	Number of Storage Elements							(LSB)
10	(MSB)	First Import/Export Element Address						
11	First Import/Export Element Address							(LSB)
12	(MSB)	Number of Import/Export Elements						
13	Number of Import/Export Elements							(LSB)
14	(MSB)	First Data Transfer Element Address						
15	First Data Transfer Element Address							(LSB)
16	(MSB)	Number of Data Transfer Elements						
17	Number of Data Transfer Elements							(LSB)
18	Reserved							
19	Reserved							

PS (Page Savable) – Byte 00, Bit 7

The value returned for this field is 1, which indicates that the library can save this page to nonvolatile memory.

Page Code – Byte 00, Bits 5 through 0

This field identifies the Element Address Assignment page. The value returned for this field is 1Dh.

Parameter Length – Byte 01

The value returned for this field is 12h (18), which indicates that there are an additional 18 bytes of element address data that follow this byte.

Medium Transport Element Address – Bytes 02 and 03

This field identifies the address of the cartridge loader. The default value for this field is 61h (97).

Number of Medium Transport Elements – Bytes 04 and 05

This field identifies the number of cartridge loaders within the library. The library has only one cartridge loader. The valid value for this field is 1.

First Storage Element Address – Bytes 06 and 07

This field identifies the starting address of the cartridge storage locations. The default starting address is 01h (1). You can change this address with the MODE SELECT (15h) command.

Number of Storage Elements – Bytes 08 and 09

This field identifies the maximum number of cartridge storage locations within the library.

- **Magnum 224 or T24**—The maximum valid value for this field is 18h (24).
- **StorageLoader 2U**—The maximum valid value for this field is 14h (20).
- **Magnum 448**—The maximum valid value for this field is 30h (48).

The number of storage elements is fixed and cannot be changed using the MODE SELECT command. See the *Magnum 224, StorageLibrary T24, or StorageLoader 2U LTO Library Product Manual* or the *Magnum 448 LTO Library Product Manual* for more information about limiting the number of cells used by the library.

Notes:

- **Magnum 224 or T24**—The cleaning cell is not available to SCSI. In this case the maximum number of storage elements is 23 and the value for this field is 17h.
- **StorageLoader 2U**—The cleaning cell is not available to SCSI. In this case the maximum number of storage elements is 19 and the value for this field is 13h.
- **Magnum 448**—The cleaning cell is not available to SCSI. In this case the maximum number of storage elements is 47 and the value for this field is 2Fh.

First Import/Export Element Address – Bytes 10 and 11

This field identifies the address of the entry/exit port. See "Element Addresses" on page 2-3 for important addressing information.

- **Magnum 224, T24, or SL 2U**—The library has one I/E port. If the I/E port element is enabled, the default starting address for the I/E port element is 71h. See the *Magnum 224, StorageLibrary T24, or StorageLoader 2U LTO Library Product Manual* for instructions on enabling and disabling the I/E port.
- **Magnum 448**—The library has two physical I/E ports, but you can "enable" the library to use zero, one, or two I/E ports through the front panel. The library ships from the factory with both I/E ports enabled. See the *Magnum 448 LTO Library Product Manual* for instructions on enabling and disabling I/E ports.
  - Bottom I/E port element enabled– the default starting address for the I/E port element is 71h.
  - Both I/E port elements enabled– the default starting address for the I/E port elements are:
    Top I/E port element–72h
    Bottom I/E port element–71h

Number of Import/Export Elements – Bytes 12 and 13

This field identifies the total number of locations used for importing and exporting cartridges into and out of the library.

- **Magnum 224, T24, or SL 2U**—The library has one I/E port. The value for this field is normally 1.

0	I/E port is disabled
1	I/E port is enabled

- **Magnum 448**—The library has two physical I/E ports, but you can "enable" the library to use zero, one, or two I/E ports through the front panel. The value for this field is normally 2 (both I/E ports enabled).

0	I/E port is disabled
1	One I/E port is enabled
2	Both I/E ports are enabled

First Data Transfer Element Address – Bytes 14 and 15

This field identifies the starting address of the installed tape drives.

- **Magnum 224, T24, or SL 2U**—The library may have one or two tape drives with a default starting address of 51h (81).

- **Magnum 448**—The library may have one, two, three, or four tape drives with a default starting address of 51h (81).

Number of Data Transfer Elements – Bytes 16 and 17

This field identifies the number of tape drives installed in the library.

- **Magnum 224, T24, or SL 2U**—The library may have one or two tape drives installed. The valid value for this field is 1 or 2.
- **Magnum 448**—The library may have one, two, three, or four tape drives installed. The valid value for this field is 1, 2, 3, or 4.

Note: The actual number of tape drives installed cannot be changed by this field. The tape drive configuration must be altered through the Front Panel under the Drive Configuration menu.

10.3.3 TRANSPORT GEOMETRY DESCRIPTOR PAGE (PAGE CODE 1Eh)

Bit Byte	7	6	5	4	3	2	1	0
00	PS	RSVD	Page Code (1Eh)					
01	Parameter Length (02h)							
02	Reserved							Rotate
03	Member Number in Transport Element Set							

PS (Page Savable) – Byte 00, Bit 7

The value returned for this field is 0, which indicates that the library cannot save this page to nonvolatile memory.

Page Code – Byte 00, Bits 5 through 0

This field identifies the Transport Geometry Descriptor page. The value returned for this field is 1Eh.

Parameter Length – Byte 01

This field indicates the number of additional bytes of transport geometry descriptor data that follow the header. Each descriptor consists of two bytes of information. The library has only one transport mechanism (cartridge loader), so the value returned for this field is 02h.

Rotate – Byte 02, Bit 0

This field indicates the ability of the transport mechanism to handle two-sided media. The library uses only one-sided media, so the value returned for this field is 0.

Member Number in Transport Element Set – Byte 03

This field indicates the specific transport element in the system to which this descriptor is applied. The library has only one transport element, so the value returned for this field is 0.

10.3.4 DEVICE CAPABILITIES PAGE (PAGE CODE 1Fh)

Bit Byte	7	6	5	4	3	2	1	0
00	PS	RSVD	Page Code (1Fh)					
01	Parameter Length (12h)							
02	Reserved				DT 1	I/E 1	ST 1	MT 0
03	Reserved							
04	Reserved				MT→DT 0	MT→I/E 0	MT→ST 0	MT→MT 0
05	Reserved				ST→DT 1	ST→I/E 1	ST→ST 1	ST→MT 0
06	Reserved				I/E→DT 1	I/E→I/E 1	I/E→ST 1	I/E→MT 0
07	Reserved				DT→DT 1	DT→I/E 1	DT→ST 1	DT→MT 0
08 ... 19	Reserved							

PS (Page Savable) – Byte 00, Bit 7

The value returned for this field is 0, which indicates that the library cannot save this page to nonvolatile memory.

Page Code – Byte 00, Bits 5 through 0

This field identifies the page code for the Device Capabilities page. The value returned for this field is 1Fh.

Parameter Length – Byte 01

The Parameter Length is 12h (18), which indicates that there are an additional 18 bytes of device capabilities data that follow this byte.

DT (Data Transfer Element) – Byte 02, Bit 3

The value returned for this field is 1, which indicates that the tape drive can store cartridges. (A cartridge in a tape drive, either loaded or ejected, is considered "stored" in the tape drive.)

I/E (Import/Export Element) – Byte 02, Bit 2

The value returned for this field indicates whether the library has an entry/exit port that can store a data cartridge. The library does have an entry/exit port. The valid value for this field is 1.

ST (Storage Element) – Byte 02, Bit 1

The value returned for this field is 1, which indicates that the cartridge storage locations can store cartridges.

MT (Media Transport) – Byte 02, Bit 0

The value returned for this field is 0, which indicates that the cartridge loader cannot store cartridges.

MT → DT – Byte 04, Bit 3

The value returned for this field is 0, which indicates that the library does not support the MOVE MEDIUM (A5h) command when the source is the cartridge loader and the destination is the tape drive.

MT → I/E – Byte 04, Bit 2

The value returned for this field is 0, which indicates that the library does not support the MOVE MEDIUM (A5h) command when the source is the cartridge loader and the destination is the entry/exit port element.

MT → ST – Byte 04, Bit 1

The value returned for this field is 0, which indicates that the library does not support the MOVE MEDIUM (A5h) command when the source is the cartridge loader and the destination is a cartridge storage location.

MT → MT – Byte 04, Bit 0

The value returned for this field is 0, which indicates that the library does not support the MOVE MEDIUM (A5h) command when the source is the cartridge loader and the destination is the cartridge loader.

ST → DT – Byte 05, Bit 3

The value returned for this field is 1, which indicates that the library supports the MOVE MEDIUM (A5h) command when the source is a cartridge storage location and the destination is a tape drive.

ST → I/E – Byte 05, Bit 2

The value returned for this field is 1, which indicates that the library supports the MOVE MEDIUM (A5h) command when the source is a cartridge storage location and the destination is the import/export element.

ST → ST – Byte 05, Bit 1

The value returned for this field is 1, which indicates that the library supports the MOVE MEDIUM (A5h) command when the source is a cartridge storage location and the destination is a cartridge storage location.

ST → MT – Byte 05, Bit 0

The value returned for this field is 0, which indicates that the library does not support the MOVE MEDIUM (A5h) command when the source is a cartridge storage location and the destination is the cartridge loader.

I/E → DT – Byte 06, Bit 3

The value returned for this field is 1, which indicates that the library supports the MOVE MEDIUM (A5h) command when the source is the import/export element and the destination is a tape drive.

I/E → I/E – Byte 06, Bit 2

The value returned for this field is 1, which indicates that the library supports the MOVE MEDIUM (A5h) command when the source is the import/export element and the destination is the import/export element.

I/E → ST – Byte 06, Bit 1

The value returned for this field is 1, which indicates that the library supports the MOVE MEDIUM (A5h) command when the source is the import/export element and the destination is a cartridge storage location.

I/E → MT – Byte 06, Bit 0

The value returned for this field is 0, which indicates that the library does not support the MOVE MEDIUM (A5h) command when the source is the import/export element and the destination is the cartridge loader.

DT → DT – Byte 07, Bit 3

The value returned for this field is 1, which indicates that the library supports the MOVE MEDIUM (A5h) command when the source is a tape drive and the destination is a tape drive.

DT → I/E – Byte 07, Bit 2

The value returned for this field is 1, which indicates that the library supports the MOVE MEDIUM (A5h) command when the source is a tape drive and the destination is the import/export element.

DT → ST – Byte 07, Bit 1

The value returned for this field is 1, which indicates that the library supports the MOVE MEDIUM (A5h) command when the source is a tape drive and the destination is a cartridge storage location.

DT → MT – Byte 07, Bit 0

The value returned for this field is 0, which indicates that the library does not support the MOVE MEDIUM (A5h) command when the source is a tape drive and the destination is the cartridge loader.

10.3.5 UNIQUE PROPERTIES PAGE (PAGE CODE 21h)

The Unique Properties Page provides information about the options for the library that are unique to the library.

Bit / Byte	7	6	5	4	3	2	1	0
00	Reserved		Page Code (21h)					
01	Page Length (4h)							
02	(MSB) Reserved							
03	Reserved (LSB)							
04	MaxStor	Reserved	MaxStorAddr					
05	Reserved	DisIEP	DisIEP2	Reserved		Dead	Reserved	

Page Code – Byte 00, Bits 5 through 0

This field identifies the Unique Properties page. The value of this field must be 21h.

Page Length – Byte 01

This field indicates the length, in bytes, of the Unique Properties parameter list. The valid value for this field is 04h (4) which indicates that there are an additional 4 bytes of data that follow this byte.

MaxStor – Byte 4, Bit 7

This field indicates whether the number of available storage elements is limited to the value specified in the MaxStorAddr field, as follows:

0	The number of available storage elements is not limited (use all of the cartridge cells as storage elements)
1	The number of available storage elements is limited to the value indicated in the MaxStorAddr field

The factory default is 0.

The number of cells reported by the library can be set, cleared, or viewed using the operator panel Limit Cells option or by issuing a MODE SELECT command with the MaxStor field set to 1.

MaxStorAddr – Byte 4, Bits 5 through 0

This field specifies how many storage elements the library reports and uses.

- **Magnum 224 or T24**—The library may have up to 24 storage slots. Valid values for this field are 4 through 24 (18h). The factory default is 18h. The library ignores the MaxStorAddr field if the MaxStor bit is set to 0. If the MaxStorAddr field is set to 24 (18h), the library responds as if the MaxStor bit is set to 0.

- **StorageLoader 2U**—The library may have up to 20 storage slots. Valid values for this field are 4 through 20 (14h). The factory default is 14h. The library ignores the MaxStorAddr field if the MaxStor bit is set to 0. If the MaxStorAddr field is set to 20 (14h), the library responds as if the MaxStor bit is set to 0.

- **Magnum 448**—The Magnum 448 LTO Library may have up to 48 storage slots. Valid values for this field are 4 through 48 (30h). The factory default is 30h. The library ignores the MaxStorAddr field if the MaxStor bit is set to 0. If the MaxStorAddr field is set to 48 (30h), the library responds as if the MaxStor bit is set to 0.

Notes:

- The MaxStorAddr is a maximum slot count that the library will use. If the count is less for any reason (I/E Port, Cleaning Slot, a blank magazine without slots) the smaller number will be used.

- The MaxStorAddr field is directly related to the Slot Count option available from the library's operator panel. When this field is set, the library only uses the number of cartridge cells specified as storage elements. The unused cells are not available for use as addressable storage elements. The number of cells can be set, cleared, or viewed using the operator panel or by issuing a MODE SELECT command with this field set to the desired number of cells.

- If both the Fixed Cleaning Cell and Auto-Clean flags are set to 1 on the Cleaning Configuration Page (see page 10-15), the cleaning cell, indicated by the MaxStorAddr field is used for the cleaning cartridge and is not accessible using SCSI commands.

- The library ignores the MaxStorAddr field if the MaxStor bit is set to 0. If the MaxStorAddr field is set to 24 (18h), 20 (14h), or 48 (30h), the library responds as if the MaxStor bit is set to 0.

- Changes to the MaxStorAddr field do not take affect until the library is reset.

DisIEP – Byte 05, Bit 6 (Disable I/E Port 1)

This field specifies whether the I/E Port is enabled or disabled.

- **Magnum 224, T24, or SL 2U**—The library has only one I/E Port (I/E Port 1).

0	I/E Port is enabled for use
1	I/E Port is disabled, the slot becomes a storage cell

- **Enabled**—Enabling the I/E port consumes the first storage slot. If the I/E port is enabled, storage slots are numbered 01h-17h starting with the storage slot beneath the I/E port.
- **Disabled**—If the I/E port is disabled, cell 71h does not exist and you have 24 storage slots.

- **Magnum 448**—The Magnum 448 LTO Library has two physical I/E Ports (I/E Port 1, which is the bottom element, and I/E Port 2, which is the top element). See DisIEP2 – Byte 05, Bit 6 (Disable I/E Port 2) for information about the second/top I/E port.

0	I/E Port is enabled for use
1	I/E Port is disabled, the slot becomes a storage cell

- **Enabled**—Enabling the *bottom* I/E port consumes the first storage slot. If this I/E port is enabled, storage slots are numbered 01h-30h starting with the storage slot beneath the I/E port.
- **Disabled**—If the *bottom* I/E port is disabled, cell 71h does not exist and you have 48 storage slots.

For additional information, see:

- Overview of elements—"Elements and Element Addresses" on page 2-2
- **Magnum 224, T24, or SL 2U** elements— "Magnum 224, T24, or SL 2U Element Addresses" on page 2-3
- **Magnum 448** elements—"Magnum 448 Element Addresses" on page 2-5

DisIEP2 – Byte 05, Bit 6 (Disable I/E Port 2)

This field specifies whether the *top* I/E Port is enabled or disabled, and applies only to the Magnum 448 LTO Library.

Magnum 448—The Magnum 448 LTO Library has two physical I/E Ports (I/E Port 1–71h, which is located in the bottom magazine, and I/E Port 2–72h, which is located in the top magazine). See DisIEP – Byte 05, Bit 6 (Disable I/E Port 1) for information about the bottom I/E port.

0	I/E Port is enabled for use
1	I/E Port is disabled, the slot becomes a storage cell

- **Enabled**—Enabling the *bottom* I/E port consumes the first storage slot. If this I/E port is enabled, storage slots are numbered 01h-30h.
  For important information about enabling *both* the bottom and top I/E ports, see "Magnum 448 Element Addresses" on page 2-5.
- **Disabled**—If the *bottom* I/E port is disabled, cell 72h does not exist and you have 48 storage slots.

Dead – Byte 05, Bit 2 (Dead Device)

This field indicates that the library requires service. This bit is normally set during operation if a non-recoverable mechanism error is detected.

0	Library does not require service
1	Library requires service

The factory default is 0.

This field is kept in nonvolatile RAM, and once set, remains in effect, even between power-on cycles, until changed by the MODE SELECT command.

10.3.6 LCD MODE PAGE (PAGE CODE 22h)

Bit Byte	7	6	5	4	3	2	1	0
00	Reserved		Page Code (22h)					
01	Parameter Length (22h)							
02	RSVD	RSVD	Reserved		Write Line 1	Reserved		
03	Reserved							
04 ... 24	Display Line 1							
25 ... 35	Reserved							

Page Code – Byte 00, Bits 5 through 0

This field identifies the LCD Mode page. The value of this field must be 22h.

Parameter Length – Byte 01

This field indicates the length, in bytes, of the LCD Mode page. The valid value for this field is 22h (34), which indicates that 34 bytes of data follow this byte.

Write Line 1 – Byte 02, Bit 3

This field indicates the type of text that appears on Display Line 1 of the LCD Status Screen (bytes 04 through 19 of the LCD Mode page), as follows:

0	Library default text
1	Text you specified in bytes 04 through 19 of the MODE SELECT LCD Mode page

The factory default is 0. You can change this field with the MODE SELECT command (see "LCD Mode Page (Page Code 22h)" on page 9-12).

Note: The text specified for Display Line 1 is displayed when the library does not have any active status to display (that is, the cartridge loader is ready to receive commands and there are no error conditions).

Display Line 1 – Bytes 04 through 24

This field indicates the text that will appear on line 1 of the LCD. Display Line 1 is typically used to specify the product name displayed on the LCD.

- **Magnum 224, T24, or SL 2U—**The default product name for the library is "Magnum 224". You can change this field with the MODE SELECT command (see "LCD Mode Page (Page Code 22h)" on page 9-12).
- **Magnum 448—**The default product name for the library is "Magnum 448". You can change this field with the MODE SELECT command (see "LCD Mode Page (Page Code 22h)" on page 9-12).

10.3.7 CLEANING CONFIGURATION PAGE (PAGE CODE 25h)

The Cleaning Configuration page indicates how the library behaves when it is configured to autoclean the tape drive.

Bit Byte	7	6	5	4	3	2	1	0
00	Reserved		Page Code (25h)					
01	Page Length (02h)							
02	Reserved						Auto	FixEnable
03	Cleaning Cartridge Storage Element							

Page Code – Byte 00, Bits 5 through 0

This field identifies the Clean Configuration page. The value of this field must be 25h.

Parameter Length – Byte 01

This field indicates the length, in bytes, of the Cleaning Configuration page. The valid value for this field is 02h (2), which indicates that 2 bytes of data follow this byte.

Auto – Byte 02, Bit 1

This bit indicates whether the library will use the cleaning cartridge in the fixed cleaning cartridge cell to clean the tape drive automatically when required, as follows:

0	Do not automatically clean drive
1	Automatically clean drive when required if a cleaning cartridge is available

This bit is only valid when the FixEnbl bit is 1.

FixEnbl – Byte 02, Bit 0

This bit indicates whether the library has a fixed cell reserved for a cleaning cartridge, as follows:

0	No cleaning cartridge reservation
1	Highest numbered Storage Element reserved for cleaning cartridge

When the FixEnbl is set to 1, the storage element with the highest element address is reserved for a cleaning cartridge. That storage element is then unavailable for storing a data cartridge. Refer to the *Magnum 224, StorageLibrary T24, or StorageLoader 2U LTO Library Product Manual* or the *Magnum 448 LTO Library Product Manual* more information about the library's Autoclean option.

Notes:

- When both the FixEnbl and the Auto bits on the Cleaning Configuration Page are set to 1 (that is, when a cell is reserved for a cleaning cartridge and the library is configured to automatically handle cleaning), the cell reserved for the cleaning cartridge, with the highest element address, is removed from the cell geometry.
- The status of reserved cell is not reported in response to the READ ELEMENT STATUS or READ ELEMENT STATUS WITH RANGE commands.
- The reserved element address is invalid for motion commands (for example, MOVE MEDIUM, POSITION TO ELEMENT).
- The valid value for the Number of Storage Elements field on the Element Address Assignment Page (1Dh) for MODE SELECT and MODE SENSE is one less than when there is no Fixed Autoclean cell.

- The handling of the element address reserved for the cleaning cartridge is unchanged on all LOG SELECT and LOG SENSE log pages.
- When a MODE SELECT command changes the values for both the FixEnbl and the Auto bits (either both turned on or both turned off), the library returns NOT READY TO READY Unit Attention (ASC/ASCQ of 28h/00h) message after the successful completion of the command.

Cleaning Cartridge Storage Element – Byte 3

This field indicates the element address of the storage element that is reserved for a cleaning cartridge. This field is only valid when the FixEnbl bit is 1.

10.3.8 OPERATING MODE PAGE (PAGE CODE 26h)

The Operating Mode page indicates the current operating mode for the library. For more information about operating modes, refer to the *Magnum 224, StorageLibrary T24, or StorageLoader 2U LTO Library Product Manual* or the *Magnum 448 LTO Library Product Manual*.

Bit Byte	7	6	5	4	3	2	1	0
00	PS	RSVD	Page Code (26h)					
01	Page Length (02h)							
02	Reserved						OperMode	
03	Reserved							

PS (Page Savable) – Byte 00, Bit 7

The value returned for this field is 0, which indicates that the library cannot save this page to nonvolatile memory.

Page Code – Byte 00, Bits 5 through 0

This field identifies the Clean Configuration page. The value of this field must be 26h.

Parameter Length – Byte 01

This field indicates the length, in bytes, of the Operating Mode page. The valid value for this field is 02h (2), which indicates that 2 bytes of data follow this byte.

OperMode – Byte 02, Bit 0 - Bit 1

This bit indicates the current operating mode for the library, as follows:

0h	Random mode
1h	Sequential mode
2h	Manual mode (the library is controlled from the operator panel)
3h	Ethernet mode (the library is controlled through the Remote Management utility)

Refer to "Setting the Operation Mode" on page 3-1, or the *Magnum 224, StorageLibrary T24, or StorageLoader 2U LTO Library Product Manual* or *Magnum 448 LTO Library Product Manual* for information about operating the library in Random and Sequential modes.

10.4 COMMAND STATUS

The library returns a status byte after processing the MODE SENSE command. This section describes when each type of status byte might be returned.

Good

The library returns Good status when it is able to process the command without errors.

Busy

Busy status indicates that the library is temporarily unable to accept a command from this initiator. The initiator may retry the command later.

Reservation Conflict

The library returns Reservation Conflict status when the library is reserved by a different initiator. See Chapter 20 for more information about the RESERVE command.

Check Condition

The library returns Check Condition status for the following reasons:

- The command is issued to an invalid LUN.
- A Unit Attention condition is pending for the initiator.
- A reserved bit is set to 1 in the CDB.
- A parameter in the CDB is invalid (see Table 10-1 for sense data).

Table 10-1 *Invalid parameters in the MODE SENSE CDB*

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	24h	00	1	1	1	—	—	A reserved bit is set in the CDB. The pointers point to the bit in error.
5h	24h	00	1	1	1	3h	0001h	Invalid value in DBD field. Must be 1.
5h	24h	00	1	1	1	5h	0002h	Invalid Page Code.

Notes

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MOVE MEDIUM (A5h)

Bit Byte	7	6	5	4	3	2	1	0
00	1	0	1	0	0	1	0	1
01	Reserved							
02	(MSB) Transport Element Address							
03	Transport Element Address (LSB)							
04	(MSB) Source Address							
05	Source Address (LSB)							
06	(MSB) Destination Address							
07	Destination Address (LSB)							
08	Reserved							
09	Reserved							
10	Reserved							Invert
11	Reserved							

11.1 About This Command

The MOVE MEDIUM command requests that the cartridge loader move a cartridge from a source element location (address) to a destination element location (address). If the destination is a tape drive, the library will insert the cartridge.

For the valid source element and destination element combinations for the MOVE MEDIUM command, refer to the Device Capabilities page of the MODE SENSE data (see page 10-8).

Notes:

- The average time required to complete this command is:
  Magnum 224, T24, or SL 2U—70 seconds.
  Magnum 448—90 seconds.

- If you use this command to move a cartridge from a tape drive and the cartridge is still inside the tape drive, the library waits 5 seconds and retries the move operation. If the cartridge is still in the tape drive at that point, the library returns Check Condition status with the sense key set to Illegal Request. The ASC is 3Bh and the ASCQ is 90h, as described in Table 11-5. The 5-second retry allows for the slight delay that can occur after a tape drive indicates that it has unloaded the tape, but before the cartridge is fully unloaded.

11.2 WHAT YOU SEND TO THE LIBRARY

Transport Element Address – Bytes 02 and 03

This field is checked for the value set by the MODE SELECT (15h) command. It should contain 0 or the element address of the cartridge loader.

Source Address – Bytes 04 and 05

This field specifies the element address from which the cartridge is to be taken. This can be a storage location, a tape drive, or the I/E port element.

Destination Address – Byte 06 and 07

This field specifies the element address where the cartridge is to be placed. This can be a storage location, a tape drive, or the I/E port element.

Invert – Byte 10, Bit 0

The library does not support the Invert function. The valid value for this field is 0.

11.3 EFFECTS ON THE CARTRIDGE INVENTORY

The cartridge inventory is updated after the cartridge loader completes a cartridge move operation, whether or not the cartridge move was successful. The various outcomes of a requested move operation are explained below:

- A cartridge move operation was requested and completed successfully (the source address contained a cartridge, the destination address was empty, and the cartridge was moved). See Table 11-1 for information about how the cartridge inventory is updated.

Table 11-1 *Effect on the cartridge inventory of a successful move operation*

This cartridge inventory field...	...is changed to the following for...	
	...the source address	...the destination address
Occupied	0	1
Occupied Valid	1	1
Label	blanks	copied from source
Label Valid	0	copied from source
Label Scan Retries	0	copied from source
Send Volume Match	0	copied from source
Tape Drive Accessible	1	0
Pick Retries	updated if retried	no change
Put Retries	no change	updated if retried
Total Puts	no change	incremented
Source Address	255	source storage element address

- A cartridge move operation is requested and the cartridge loader finds the source address empty. The library does not attempt to move a cartridge if the cartridge inventory indicates that the source is empty (the Occupied flag is set to 0 and Occupied Valid flag is set to 1). See Table 11-2 for information about how the cartridge inventory is updated.

Table 11-2 *Effect on the cartridge inventory of a move operation when the source is empty*

This cartridge inventory field...	...is changed to the following for...	
	...the source address	...the destination address
Occupied	0	no change
Occupied Valid	1	no change
Label	blanks	no change
Label Valid	0	no change
Label Scan Retries	0	no change
Send Volume Match	0	no change
Tape Drive Accessible	no change	no change
Pick Retries	no change	no change

Table 11-2 *Effect on the cartridge inventory of a move operation when the source is empty (continued)*

This cartridge inventory field...	...is changed to the following for...	
	...the source address	...the destination address
Put Retries	no change	no change
Total Puts	no change	no change
Source Address	255	no change

- A cartridge move operation is requested and the cartridge loader finds that the destination address contains a cartridge. Table 11-3 describes how the cartridge inventory is updated.

  Note: The library does not perform the move operation if the cartridge inventory indicates that the destination is occupied and the Occupied Valid flag is set to 1.

Table 11-3 *Effect on the cartridge inventory of a move operation when the destination is full*

This cartridge inventory field...	...is changed to the following for...	
	...the source address	...the destination address
Occupied	1	1
Occupied Valid	1	1
Label	no change	no change
Label Valid	no change	no change
Label Scan Retries	no change	no change
Send Volume Match	no change	no change
Tape Drive Accessible	1	no change
Pick Retries	updated if retried	no change
Put Retries	updated if retried	no change
Total Puts	incremented	no change
Source Address	no change	no change

- A cartridge move operation was requested with the same source and destination address. This type of operation is requested when the occupied status of a location is questionable (the Occupied Valid flag is set to 0). The library does not attempt to move a cartridge if the Occupied Valid flag is set to 1 for the source and destination address and the location is a storage location. Table 11-4 describes how the cartridge inventory is updated.

Table 11-4 *Effect on the cartridge inventory of a move operation when the source and destination are the same*

This cartridge inventory field...	.....is changed to the following when...	
	...the location is empty	...the location is full
Occupied	0	1
Occupied Valid	1	1
Label	blanks	no change
Label Valid	0	no change
Label Scan Retries	0	no change
Send Volume Match	0	no change
Tape Drive Accessible	no change	0
Pick Retries	no change	updated if retried
Put Retries	no change	updated if retried
Total Puts	no change	incremented
Source Address	255	element address

11.4 COMMAND STATUS

The library returns a status byte after processing the MOVE MEDIUM command.

Good

The library returns Good status when it is able to process the command without errors.

Busy

Busy status indicates that the library is temporarily unable to accept a command from this initiator. The initiator may retry the command later.

Reservation Conflict

The library returns Reservation Conflict status when it is reserved by a different initiator. See Chapter 20 for more information about the RESERVE command.

Check Condition

The library returns Check Condition status for the following reasons:

- The command is issued to an invalid LUN.
- A Unit Attention condition is pending for the initiator.
- The library has experienced an unrecoverable hardware error.
- A reserved bit is set to 1 in the CDB.
- The library is not ready because a magazine is removed.
- The information in the cartridge inventory indicates that the requested cartridge move operation cannot be performed.
- After the library attempts to move a cartridge, it finds that the source is empty or the destination is occupied.
- The library encounters a problem while trying to move a cartridge. For example, it encounters a place (put) error while moving a cartridge.
- A parameter in the CDB is invalid (see Table 11-5 for sense data).

Table 11-5 *Invalid parameters in the MOVE MEDIUM CDB and move errors*

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
3h	53h	00h	0	0	0	0	0	Media load or eject failed
5h	21h	01h	1	1	0	0	0002h	Invalid transport element address.
5h	21h	01h	1	1	0	0	0004h	Invalid source element address.
5h	21h	01h	1	1	0	0	0006h	Invalid destination element address.
5h	24h	00	1	1	1	0	000Ah	Invalid Invert field.
5h	24h	00h	1	1	1	—	—	A reserved bit is set in the CDB. The pointers point to the bit in error.
5h	3Bh	0Dh	0	0	0	0	0	Destination element occupied.
5h	3Bh	0Eh	0	0	0	0	0	Source element empty.
5h	3Bh	87h	0	0	0	0	0	Cartridge stuck in tape drive.
5h	3Bh	90h	0	0	0	0	0	Source cartridge is loaded inside the tape drive and is not accessible.
5h	80h	05h	0	0	0	0	0	Source tape drive not installed.
5h	80h	06h	0	0	0	0	0	Destination tape drive not installed.

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POSITION TO ELEMENT (2Bh)

Bit Byte	7	6	5	4	3	2	1	0
00	0	0	1	0	1	0	1	1
01	Reserved							
02	(MSB) Transport Element Address							
03	Transport Element Address (LSB)							
04	(MSB) Destination Element Address							
05	Destination Element Address (LSB)							
06	Reserved							
07	Reserved							
08	Reserved							Invert
09	Reserved							

12.1 About This Command

The POSITION TO ELEMENT command allows you to request that the cartridge loader be positioned to a specific element location (address).

The cartridge loader is positioned so that no additional movement is required to access the cartridge at that location for a MOVE MEDIUM (A5h) command. Use this command with an application that may require a pause before issuing a MOVE MEDIUM command. The time that you save with the POSITION TO ELEMENT command is valuable if you would normally have to wait for the cartridge loader to move to the element when you issue the MOVE MEDIUM command.

Note: The average time required to complete this command is:
Magnum 224, T24, or SL 2U—10 seconds.
Magnum 448—15 seconds.

12.2 WHAT YOU SEND TO THE LIBRARY

Transport Element Address – Bytes 02 and 03

This field is checked for the value set by the MODE SELECT (15h) command. It should contain 0 or the element address of the cartridge loader.

Destination Element Address – Bytes 04 and 05

This field allows you to specify the address of the element where the cartridge loader is to be positioned.

Invert – Byte 08, Bit 0

The library does not support the Invert function, so you must specify a value of 0 for this bit.

12.3 COMMAND STATUS

The library returns a status byte after processing the POSITION TO ELEMENT command. This section describes when each type of status byte might be returned.

Good

The library returns Good status when it is able to process the command without errors.

Busy

Busy status indicates that the library is temporarily unable to accept a command from this initiator. The initiator may retry the command later.

Reservation Conflict

The library returns Reservation Conflict status when it is reserved by a different initiator. See Chapter 20 for more information about the RESERVE command.

Check Condition

The library returns Check Condition status for the following reasons:

- The command is issued to an invalid LUN.
- A Unit Attention condition is pending for the initiator.
- The library has experienced an unrecoverable hardware error.
- The library is not ready because a magazine is removed.
- The destination is a tape drive and the tape drive is not installed.
- The library encounters a problem during the position operation.

- A reserved bit is set to 1 in the CDB.
- A parameter in the CDB is invalid (see Table 12-1 for sense data).

Table 12-1 *Invalid parameters in POSITION TO ELEMENT CDB and position errors*

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	21h	01h	1	1	0	—	0002h	Invalid transport element address.
5h	21h	01h	1	1	0	—	0004h	Invalid destination element address.
5h	24h	00h	1	1	1	—	—	A reserved bit is set in the CDB. The pointers point to the bit in error.
5h	24h	00h	1	1	1	0	000Ah	Invalid Invert field.
5h	80h	06h	0	0	0	0	0000h	Destination tape drive is not installed.

Notes

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PREVENT/ALLOW MEDIUM REMOVAL (1Eh)

Bit Byte	7	6	5	4	3	2	1	0
00	0	0	0	1	1	1	1	0
01	Reserved							
02	Reserved							
03								
04	Reserved							Prevent
05	Reserved							

13.1 About This Command

The PREVENT/ALLOW MEDIUM REMOVAL command requests that the library enable or disable access to the cartridge storage area. If at least one initiator has issued this command to prevent cartridge removal, then the I/E Port(s) and magazines cannot be opened from the operator panel.

13.2 What You Send to the Library

Prevent – Byte 04, Bits 1 and 0

The valid values for this field are as follows:

00b	Allow removal of cartridges through the cartridge access port door
01b	Prevent removal of cartridges through the cartridge access port door
10b	Invalid
11b	Invalid

When the Prevent bit is set to 01b, an interlock mechanism on the cartridge access port door activates to prevent the door from being opened until one of the following occurs:

- All initiators that have issued PREVENT MEDIUM REMOVAL commands issue ALLOW MEDIUM REMOVAL commands with the Prevent bit set to 0.
- The library is reset (see Section 3.2 on page 3-4 for information about library resets).

13.3 COMMAND STATUS

The library returns a status byte after processing the PREVENT/ALLOW MEDIUM REMOVAL command. This section describes when each type of status byte might be returned.

Good

The library returns Good status when it is able to process the command without errors.

Busy

Busy status indicates that the library is temporarily unable to accept a command from this initiator. The initiator may retry the command later.

Reservation Conflict

The library returns Reservation Conflict status when it is reserved by a different initiator and a request is made to prevent medium removal. See Chapter 20 for more information about the RESERVE command.

Check Condition

The library returns Check Condition status when:

- The command is issued to an invalid LUN.
- A Unit Attention condition is pending for the initiator.
- A reserved bit is set to 1 in the CDB.

Table 13-1 *Invalid parameters in the PREVENT/ALLOW MEDIUM REMOVAL CDB*

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	24h	00h	1	1	1	—	—	A reserved bit is set in the CDB. The pointers point to the bit in error.

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READ BUFFER (3Ch)

Bit Byte	7	6	5	4	3	2	1	0
00	0	0	1	1	1	1	0	0
01	Reserved					Mode		
02	Buffer ID							
03	(MSB)							
04	Buffer Offset							
05								(LSB)
06	(MSB)							
07	Allocation Length							
08								(LSB)
09	0	0	Reserved				0	0

14.1 About This Command

The READ BUFFER command is used to copy the library's microcode (also known as firmware) across the SCSI bus to the initiator.

Note: The READ BUFFER command does not transfer the library's configuration options or the MODE SELECT defaults to the initiator.

The READ BUFFER command does not create a copy of firmware suitable for downloading into a library.

14.2 WHAT YOU SEND TO THE LIBRARY

Mode – Byte 01, Bits 2 through 0

The Mode field determines the type of operation to be performed. The library supports the following operations:

001b	Read Firmware from library (Buffer ID is ignored)
010b	Read Data (see Buffer ID)
011b	Read Buffer header

Buffer ID – Byte 02

This field determines the type of buffer data to be transferred, as follows:

Value	Mode	Description
00h	001b	Read data from Firmware EPROM
	010b	Read data from Read/Write buffer as set by Write Buffer command
	011b	Read Offset and Buffer length information for Read/Write Buffer
80h	001b	Read data from Firmware EPROM
	010b	Read data from Diagnostic Data
	011b	Read Offset and Buffer length information for Diagnostic Data

Buffer Offset – Bytes 03 through 05

This field specifies the offset into the library memory buffer specified by the Mode field (byte 1, bits 2 through 0), as follows:

Mode	Description
001b	Offset specifies the offset into the code firmware
010b (Buffer ID 00h)	Offset is into the Read/Write Buffer
010b (Buffer ID 80h)	Offset must always be 0000h and returned data will always begin at the start of the Diagnostic Data
011b	Offset is ignored and the header is always returned.

Allocation Length – Bytes 06 through 08

This field specifies the number of bytes to be transferred by the current READ BUFFER command. If the number of bytes specified is larger than the buffer size, only the number of bytes in the buffer will be returned.

Mode	Allocation length specifies the number of...
001b	bytes of firmware code to return Up to 100100h bytes may be returned.
010b	data bytes to return Up to FFE0h bytes may be returned.
011b	header bytes to return This should be at least 4.

14.3 WHAT THE LIBRARY RETURNS

Value	Mode	Description
00h	001b	Read data from Firmware EPROM
	010b	Read data from Read/Write buffer as set by Write Buffer command
	011b	Read Offset and Buffer length information for Read/Write Buffer Format is shown in the following table.

Bit Byte	7	6	5	4	3	2	1	0
00	Offset Boundary							
01	(MSB)							
02	Buffer Capacity							
03								(LSB)

Offset Boundary – Byte 00

This field specifies the boundary alignment within the buffer as a power of two number of bytes. The buffer has a boundary alignment of 4 (2^2) so the value of this field will always be 2h.

Buffer Capacity – Bytes 01 through 03

The Buffer Capacity field specifies in bytes the storage available in the buffer for reading and writing.

Value	Mode	Description
80h	001b	Read data from Firmware EPROM
	010b	Read data from Diagnostic Data
	011b	Read Offset and Buffer length information for Diagnostic Data (see table above)

14.4 EXCEPTIONS AND ERROR CONDITIONS

If a hardware or SCSI bus error occurs while the data is being transferred from the library to the initiator, the library terminates the command and returns Check Condition status. The sense key is set to Aborted Command (Bh). If this occurs, retry the operation.

14.5 COMMAND STATUS

The library returns a status byte after processing the READ BUFFER command. This section describes when each type of status byte might be returned.

Good

The library returns Good status when it is able to process the command without errors.

Busy

Busy status indicates that the library is temporarily unable to accept a command from this initiator. The initiator may retry the command later.

Reservation Conflict

The library returns Reservation Conflict status when it is reserved by a different initiator. See Chapter 20 for more information about the RESERVE command.

Check Condition

The library returns Check Condition status for the following reasons:

- The command was issued to an invalid LUN.
- A Unit Attention condition is pending for the initiator.
- A parameter in the CDB is invalid (see Table 14-1 for sense data).

Table 14-1 *Invalid parameters in the READ BUFFER CDB*

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	1Ah	00h	1	1	0	0	0006h	Invalid Parameter List Length.
5h	24h	00h	1	1	0	0	0001h	Invalid Mode value.
5h	24h	00h	1	1	0	0	0002h	Invalid Buffer ID value.
5h	24h	00h	1	1	0	0	0003h	Invalid buffer offset.
5h	24h	00h	1	1	0	0	0006h	Invalid Combination of Buffer Offset and Parameter List Length

Notes

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READ ELEMENT STATUS (B8h)

Bit Byte	7	6	5	4	3	2	1	0
00	1	0	1	1	1	0	0	0
01	Reserved			VolTag	Element Type Code			
02	(MSB) Starting Element Address							
03	(LSB)							
04	(MSB) Number of Elements							
05	(LSB)							
06	Reserved						CurData	DVCID
07	(MSB) Allocation Length							
08								
09	(LSB)							
10	Reserved							
11	S/N Req (Obsolete)	Reserved					0	0

15.1 About This Command

The READ ELEMENT STATUS command requests that the library return the status of its elements. This command returns the data created as a result of the INITIALIZE ELEMENT STATUS (07h) or INITIALIZE ELEMENT STATUS WITH RANGE (37h) command. For more information about these commands, see Chapter 4 and Chapter 5.

15.2 WHAT YOU SEND TO THE LIBRARY

VolTag – Byte 01, Bit 4

This bit indicates whether you want the library to return volume tag (bar code label) information in response to this command, as follows:

0	Do not return volume tag (bar code label) information
1	Return volume tag (bar code label) information

Element Type Code – Byte 01, Bits 3 through 0

This field specifies the particular element types you want the library to report on. The library supports the following Element Type Codes:

0h	All element types
1h	Medium Transport Element (cartridge loader)
2h	Storage Element (cartridge cells)
3h	I/E Port Element (cartridge access port)
4h	Data Transfer Element (tape drives)

For an Element Type Code of 0h, the element types are reported in element address order, beginning with the Starting Element Address.

Starting Element Address – Bytes 02 and 03

This field indicates the element address at which to start the transfer of data. Only elements with addresses greater than or equal to the starting address are reported. Element descriptor blocks are not generated for undefined element addresses.

Number of Elements – Bytes 04 and 05

This field specifies the maximum number of element descriptors to be returned. This is an actual number of element descriptors to be returned, not an element address range.

The library returns element descriptors of the requested element type starting with the first element address equal to or greater than the value in the Starting Element Address field.

CURDATA – Byte 06, Bit 1

The CURDATA (current data) bit determines whether the library allows device motion in order to update element status, as follows:

0	May use motion to confirm device status
1	May not use motion; must use currently available data

DVCID – Bytes 06, Bit 0

The DVCID (device ID) bit indicates whether the library appends the device identifier for the tape drive, if available, to the standard data transfer element descriptor, as follows:

0	Do not append the device identifier
1	Append the device identifier

Allocation Length – Bytes 07 through 09

This field specifies the length in bytes of the space that you are allocating for returned element descriptors. Only complete element descriptors are returned. The library returns element descriptors until *one* of the following conditions is met:

- All available element descriptors have been returned.
- The number of element descriptors specified in the Number of Elements field has been returned.
- The remaining allocation length is smaller than the next complete element descriptor or header to be returned.

S/N Request – Byte 11, Bit 7 (Obsolete)

Note: This field is obsolete and only retained for compatibility. The DVCID field should be used to match drives to libraries (see DVCID – Bytes 06, Bit 0).

This bit indicates whether the library appends the ten-byte tape drive serial number to the standard data transfer element descriptor, as follows:

0	Do not append the tape drive serial number
1	Append the tape drive serial number

15.3 WHAT THE LIBRARY RETURNS

This section describes the Element Status page structure and the element descriptors that the library supports. The Element Status page begins with an eight-byte Element Status Header, followed the requested element descriptors.

15.3.1 ELEMENT STATUS HEADER

This header is returned once for each READ ELEMENT STATUS command received by the library.

Bit Byte	7	6	5	4	3	2	1	0
00	(MSB) First Element Address Reported							
01								(LSB)
02	(MSB) Number of Elements Reported							
03								(LSB)
04	Reserved							
05	(MSB) Byte Count of Report Available							
06								
07								(LSB)

First Element Address Reported – Bytes 00 and 01

This field indicates the smallest element address found that meets the CDB requirements.

Number of Elements Reported – Bytes 02 and 03

This field indicates the total number of elements that meet the CDB requirements. The library returns element descriptors for these elements if you specified a sufficient Allocation Length.

Byte Count of Report Available – Bytes 05 through 07

This field indicates the total number of bytes of element status page data available that meet the CDB requirements. This value is not adjusted to match the value that you specified for the Allocation Length field in the CDB.

15.3.2 ELEMENT STATUS PAGE

The library returns one Element Status page for each group of element descriptors of the same type (that is, it returns one page for each of the following: cartridge loader, cartridge storage locations, I/E ports, and tape drives). The Element Status page is returned only if there is at least one Element Descriptor also being returned.

Bit Byte	7	6	5	4	3	2	1	0
00	Element Type Code							
01	PVolTag	AVolTag	Reserved					

02	(MSB)	Element Descriptor Length
03		(LSB)
04	Reserved	
05	(MSB)	Byte Count of Descriptor Data Available
06		
07		(LSB)

Element Type Code – Byte 00

This field indicates the specific element type (see page 15-2) being reported by the element descriptor.

PVolTag – Byte 01, Bit 7

This field indicates if primary volume tag (bar code label) information is present, as follows:

0	Volume tag bytes are omitted from the element descriptors
1	Volume tag information is present

AVolTag – Byte 01, Bit 6

The library does not support alternate volume tags. The value reported for this field is 0.

Element Descriptor Length – Bytes 02 and 03

This field indicates the total number of bytes contained in a single element descriptor, as follows:

- If the descriptor being returned is for either the medium transport element (the cartridge loader) or a storage element (cartridge cell), the length is either 52 bytes (if the VolTag bit is 1) or 16 bytes (if the VolTag bit is 0).
- If the descriptor being returned is for a data transfer element (a tape drive), the element descriptor length changes depending on the setting of the DVCID, VolTag, and S/N Req bits, as shown in Table 15-1.

Table 15-1 *Element descriptor length for the data transfer element*

DVCID	VolTag	S/N Req	Element Descriptor Length (bytes)
0	0	0	16
0	0	1	26
0	1	0	52
0	1	1	62
1	0	0	62

Table 15-1 *Element descriptor length for the data transfer element*

DVCID	VolTag	S/N Req	Element Descriptor Length (bytes)
1	0	1	72
1	1	0	98
1	1	1	108

Byte Count of Descriptor Data Available – Bytes 05 through 07

This field indicates the total number of bytes of element descriptor data available for the elements of this element type that meet the CDB requirements. This value is the Element Descriptor Length multiplied by the number of element descriptors. This value is not adjusted to match the value that you specified in the Allocation Length field of the CDB.

15.3.3 ELEMENT DESCRIPTORS

The following sections contain the field definitions for the four types of element descriptors for the library:

- **Medium transport element**: The cartridge loader
- **Storage elements**: The cartridge cells
- **I/E port element(s)**: The cartridge access port
- **Data transfer element**: The tape drive

Each element descriptor includes the element address and status flags. Each element descriptor can also contain sense code information as well as other information, depending on the element type.

Notes:

- The element descriptors for the elements are very similar, with the exception of a few of the fields. Note the differences in bytes 02, 06, and 07 for the element descriptors.
- The library does not support alternate volume tags. This information is not included in any of the element descriptors.

15.3.4 MEDIUM TRANSPORT ELEMENT DESCRIPTOR

The medium transport element is the cartridge loader (robot). The library contains one cartridge loader, for which it returns the following medium transport element descriptor.

Bit Byte	7	6	5	4	3	2	1	0
00	(MSB)							
01				Element Address				(LSB)
02				Reserved		Except	RSVD	Full
03				Reserved				
04				Additional Sense Code				
05				Additional Sense Code Qualifier				
06								
07				Reserved				
08								
09	SValid	Invert		Reserved				
10	(MSB)							
11				Source Storage Element Address				(LSB)
12 ... 47				Primary Volume Tag Information (field omitted if PVolTag = 0)				
48 ... 51				Reserved (field moved up if PVolTag = 0)				

Element Address – Bytes 00 and 01

This field contains the element address of the medium transport element (cartridge loader).

Except – Byte 02, Bit 2

The Except (exception) bit indicates the current state of the cartridge loader, as follows:

0	The cartridge loader is in a normal state
1	The cartridge loader is in an abnormal state and the Additional Sense Code and the Additional Sense Code Qualifier fields contain information regarding the abnormal state.

Full – Byte 02, Bit 0

This field indicates if the cartridge loader contains a cartridge. The possible values for this field are as follows:

0	The cartridge loader does not contain a cartridge
1	The cartridge loader contains a cartridge

Additional Sense Code (ASC) – Byte 04

If the cartridge loader is in an abnormal state, this field contains the value 83h. Refer to Table 15-3 on page 15-20 for the corresponding ASCQ values and a corrective action for each abnormal state.

Additional Sense Code Qualifier (ASCQ) – Byte 05

The values for this field are listed in Table 15-3 on page 15-20, along with the corrective action to take for each abnormal state.

SValid – Byte 09, Bit 7

The values for this bit indicate the following:

0	The Source Storage Element Address field (bytes 10 and 11) is invalid
1	The Source Storage Element Address field (bytes 10 and 11) is valid

Invert – Byte 09, Bit 6

The library uses single-sided media and does not support inverting of the media. The information reported for this field is 0.

Source Storage Element Address – Bytes 10 and 11

This field shows the address of the last storage element from which the cartridge was moved.

Primary Volume Tag Information – Bytes 12 through 47

When the PVolTag field (in the Element Status page described on page 15-5) is set to 1, this field contains the volume tag (bar code label) information of the cartridge in the cartridge loader. The library supports only eight bytes of volume tag information, so only the first eight bytes reported are valid.

15.3.5 STORAGE ELEMENT DESCRIPTOR

Each of the library's cartridge cells is a storage element. If the library's Limit Number of Cells option is turned on, or if the MaxStor and MaxStorAddr fields are set on the MODE SELECT Unique Properties Page (see page 9-8), the number of storage elements reported is equal to the number of addressable cells specified. See the *Magnum 224, StorageLibrary T24, or StorageLoader 2U LTO Library Product Manual* or the *Magnum 448 LTO Library Product Manual* for more information about changing the number of addressable cells from the LCD.

- **Magnum 224 or T24**—The maximum number of cartridge cells is 24.
- **StorageLoader 2U**—The maximum number of cartridge cells is 20.
- **Magnum 448**—The maximum number of cartridge cells is 48.

Notes:

- **Magnum 224 or T24**—If both the Fixed Cleaning Cell and Auto-Clean flags are set to 1 on the MODE SELECT Cleaning Configuration Page (see page 9-13) is set to 1, the cleaning cell may not be available to SCSI. In this case the maximum number of storage elements is 23 and the value for this field is 17h.

- **StorageLoader 2U**—If both the Fixed Cleaning Cell and Auto-Clean flags are set to 1 on the MODE SELECT Cleaning Configuration Page (see page 9-13) is set to 1, the cleaning cell may not be available to SCSI. In this case the maximum number of storage elements is 19 and the value for this field is 13h.

- **Magnum 448**—If both the Fixed Cleaning Cell and Auto-Clean flags are set to 1 on the MODE SELECT Cleaning Configuration Page (see page 9-13) is set to 1, the cleaning cell may not be available to SCSI. In this case the maximum number of storage elements is 47 and the value for this field is 2Fh.

For each storage element, the library returns the following storage element descriptor.

Bit Byte	7	6	5	4	3	2	1	0
00	(MSB)							
01				Element Address				(LSB)
02	Reserved				Access	Except	RSVD	Full
03	Reserved							
04	Additional Sense Code							
05	Additional Sense Code Qualifier							
06								
07	Reserved							
08								
09	SValid	Invert	Reserved					

10	(MSB) Source Storage Element Address
11	(LSB)
12 ... **47**	Primary Volume Tag Information (field omitted if PVolTag = 0)
48 ... **51**	Reserved (field moved up if PVolTag = 0)

Element Address – Bytes 00 and 01

This field contains the address of the cartridge storage location (cartridge cell).

Access – Byte 02, Bit 3

This bit indicates whether the cartridge loader can access the cartridge at that location.

0	The cell is accessible
1	The cell is not currently accessible

Except – Byte 02, Bit 2

The Except (exception) bit indicates the current state of the cartridge cell, as follows:

0	The cartridge cell is in a normal state
1	The cartridge cell is in an abnormal state and the Additional Sense Code and the Additional Sense Code Qualifier fields contain information regarding the abnormal state

Full – Byte 02, Bit 0

This bit indicates whether the cartridge cell contains a cartridge, as follows:

0	The cell does not contain a cartridge
1	The cell contains a cartridge

Additional Sense Code (ASC) – Byte 04

If the Except bit is set to 1, this field contains the value 83h. Refer to Table 15-3 on page 15-20 for the corresponding ASCQ values and a corrective action for each abnormal state.

Additional Sense Code Qualifier (ASCQ) – Byte 05

The values for this field are listed in Table 15-3 on page 15-20, along with the corrective action to take for each abnormal state.

SValid – Byte 09, Bit 7

The values for this bit indicate the following:

0	The Source Storage Element Address field (bytes 10 and 11) is invalid
1	The Source Storage Element Address field (bytes 10 and 11) is valid

Invert – Byte 09, Bit 6

The library uses single-sided media and does not support inverting of the media. The value reported for this field is 0.

Source Storage Element Address – Bytes 10 and 11

This field shows the address of the last storage element from which the cartridge was moved.

Primary Volume Tag Information – Bytes 12 through 47

When the PVolTag field (in the Element Status page described on page 15-5) is set to 1, this field contains the volume tag (bar code label) information of the cartridge in the storage location. The library supports eight bytes of volume tag information, so only the first eight bytes reported are valid.

15.3.6 IMPORT/EXPORT ELEMENT DESCRIPTOR

If enabled, the library has the following I/E port elements (cartridge access ports), for which it returns the following I/E element descriptor.

- **Magnum 224, T24, or SL 2U**—The library has one I/E port.
- **Magnum 448**—The library has two physical I/E ports, but you can "enable" the library to use zero, one, or two I/E ports through the front panel.

Bit Byte	7	6	5	4	3	2	1	0
00	(MSB) Element Address							
01	Element Address (LSB)							
02	Reserved		INENAB	EXENAB	Access	Except	IMPEXP	Full
03	Reserved							
04	Additional Sense Code							
05	Additional Sense Code Qualifier							

06	Reserved		
07			
08			
09	SValid	Invert	Reserved
10	(MSB) Source Storage Element Address		
11			(LSB)
12 ... **47**	Primary Volume Tag Information (field omitted if PVolTag = 0)		
48 ... **51**	Reserved (field moved up if PVolTag = 0)		

INENAB (Import Enable) – Byte 02, Bit 5

This field indicates whether the I/E port element supports movement of media into the cartridge handler.

0	Medium may not be imported into cartridge handler from I/E port
1	Medium may be imported into cartridge handler from I/E port

Since such movement is supported, the value of this bit will always be 1.

EXENAB (Export Enable) – Byte 02, Bit 4

This field indicates whether the I/E port element supports movement of media from the cartridge handler into the I/E port element.

0	Medium may not be exported into the I/E port
1	Medium may be exported into the I/E port

Since such movement is supported, the value of this bit will always be 1.

IMPEXP (Import Export) – Byte 02, Bit 1

This field indicates where the unit of media in the I/E port element originated.

0	Medium in the I/E port was placed there by the cartridge handling system
1	Medium in the I/E port was placed there by the operator

Access – Byte 02, Bit 3

This bit indicates whether the cartridge loader can access the cartridge at that location.

0	The cell is not currently accessible
1	The cell is accessible

Except – Byte 02, Bit 2

The Except (exception) bit indicates the current state of the cartridge cell, as follows:

0	The cartridge cell is in a normal state
1	The cartridge cell is in an abnormal state and the Additional Sense Code and the Additional Sense Code Qualifier fields contain information regarding the abnormal state

Full – Byte 02, Bit 0

This bit indicates whether the cartridge cell contains a cartridge, as follows:

0	The cell does not contain a cartridge
1	The cell contains a cartridge

Additional Sense Code (ASC) – Byte 04

If the Except bit is set to 1, this field contains the value 83h. Refer to Table 15-3 on page 15-20 for the corresponding ASCQ values and a corrective action for each abnormal state.

Additional Sense Code Qualifier (ASCQ) – Byte 05

The values for this field are listed in Table 15-3 on page 15-20, along with the corrective action to take for each abnormal state.

SValid – Byte 09, Bit 7

The values for this bit indicate the following:

0	The Source Storage Element Address field (bytes 10 and 11) is invalid
1	The Source Storage Element Address field (bytes 10 and 11) is valid

Invert – Byte 09, Bit 6

The library uses single-sided media and does not support inverting of the media. The value reported for this field is 0.

Source Storage Element Address – Bytes 10 and 11

This field shows the address of the last storage element from which the cartridge was moved.

Primary Volume Tag Information – Bytes 12 through 47

When the PVolTag field (in the Element Status page described on page 15-5) is set to 1, this field contains the volume tag (bar code label) information of the cartridge in the storage location. The library supports eight bytes of volume tag information, so only the first eight bytes reported are valid.

15.3.7 DATA TRANSFER ELEMENT DESCRIPTOR

The library has the following data transfer elements (tape drives), for which it returns the following data transfer element descriptor.

- **Magnum 224, T24, or SL 2U**—The library may have one or two tape drives installed.
- **Magnum 448**—The library may have one, two, three, or four tape drives installed.

Bit Byte	7	6	5	4	3	2	1	0
00	(MSB)							
01	Element Address							(LSB)
02	Reserved				Access	Except	RSVD	Full
03	Reserved							
04	Additional Sense Code							
05	Additional Sense Code Qualifier							
06	RSVD	RSVD	IDValid	LUValid	RSVD	Logical Unit Number		
07	SCSI Bus Address							
08	Reserved							
09	SValid	Invert	Reserved					
10	(MSB)							
11	Source Storage Element Address							(LSB)
12 ... 47	Primary Volume Tag Information (omitted if PVolTag = 0)							

48	Reserved	Code Set 1
49	Reserved	Identifier Type 1
50	Reserved	
51	Identifier Length 1 (22h)	
52 **...** **85**	(MSB) Device Identifier 1 (omitted if DVCID = 0) (field moved up if PVolTag = 0) (LSB)	
86	Reserved	Code Set 2
87	Reserved	Identifier Type 2
88	Reserved	
89	Identifier Length 2 (8h)	
90 **...** **97**	(MSB) Device Identifier 2 (omitted if DVCID = 0) (LSB)	
98 **...** **107**	(MSB) (Obsolete) Tape Drive Serial Number (omitted if S/N Req = 0) (LSB)	

Element Address – Bytes 00 and 01

This field contains the address of the data transfer element (the tape drive).

- **Magnum 224, T24, or SL 2U**—The library may have one or two tape drives with a default starting address of 51h (81).
- **Magnum 448**—The library may have one, two, three, or four tape drives with a default starting address of 51h (81).

Access – Byte 02, Bit 3

This bit indicates whether the cartridge loader can pick or place a cartridge at the tape drive location. The cartridge is accessible if it is ejected from the tape drive. Accessibility is reported as follows:

0	The tape drive location may not be accessible (a cartridge is loaded in the tape drive, or the tape drive's status is unknown)
1	The tape drive location is accessible (a cartridge is protruding from the tape drive, or the drive is empty)

Except – Byte 02, Bit 2

The Except (exception) bit indicates the current state of the tape drive, as follows:

0	The tape drive is in a normal state
1	The tape drive is in an abnormal state and the Additional Sense Code and the Additional Sense Code Qualifier fields contain information regarding the abnormal state

Full – Byte 02, Bit 0

This bit indicates if the tape drive contains a cartridge, as follows:

0	The tape drive does not contain a cartridge
1	The tape drive contains a cartridge

Additional Sense Code (ASC) – Byte 04

If the tape drive is in an abnormal state, this field contains the value 83h. Refer to Table 15-3 on page 15-20 for the corresponding ASCQ values and a corrective action for each abnormal state.

Additional Sense Code Qualifier (ASCQ) – Byte 05

The values for this field are listed in Table 15-3 on page 15-20, along with the corrective action to take for each abnormal state.

IDValid – Byte 06, Bit 5

This bit indicates that the SCSI Bus Address field (byte 07) contains valid information as follows:

0	The SCSI Bus Address field is not valid because a tape drive is not installed at this location
1	The SCSI Bus Address field is valid because a tape drive is installed at this location

LUValid – Byte 06, Bit 4

This bit indicates that the Logical Unit Number field (byte 06, bits 2 through 0) contains valid information as follows:

0	The Logical Unit Number field is not valid because a tape drive is not installed at this location
1	The Logical Unit Number field is valid because a tape drive is installed at this location

Logical Unit Number – Byte 06, Bits 2 through 0

The value reported for this field is 0.

SCSI Bus Address – Byte 07

The value reported for this field is the tape drive's SCSI ID.

SValid – Byte 09, Bit 7

The values for this bit indicate the following:

0	The Source Storage Element Address field (bytes 10 and 11) is invalid
1	The Source Storage Element Address field (bytes 10 and 11) is valid

Invert – Byte 09, Bit 6

The library uses single-sided media and does not support inverting the media. The value reported for this bit is 0.

Source Storage Element Address – Bytes 10 and 11

This field shows the address of the last storage element from which the cartridge was moved.

Primary Volume Tag Information – Bytes 12 through 47

When the PVolTag field (in the Element Status page described on page 15-5) is set to 1, the Primary Volume Tag Information field contains the volume tag (bar code label) information of the element being reported by this element descriptor. The library supports eight bytes of volume tag information, so only the first eight bytes reported are valid.

Note: Although the library cannot scan a cartridge loaded in a tape drive, bar code label information can be reported if the cartridge was scanned before it was loaded inside the tape drive. The library obtains this information from the cartridge inventory. Check to see if the Except field (byte 02, bit 2) is set to 1. If it is, the label information reported may be inaccurate because the cartridge inventory is questionable.

Code Set 1 – Byte 48, Bits 3 through 0

The value returned for this field is 2h, which indicates that the Device Identifier 1 field (Bytes 52-85) contains ASCII characters. If DVCID is 0, the value for this field is set to 0.

Identifier Type 1 – Byte 49, Bits 3 through 0

The value returned for this field is 1h, which indicates that the first eight bytes of the field contain the tape drive's Vendor Identification as returned in the tape drive's Standard Inquiry Data. If DVCID is 0, the value for this field is set to 0.

Identifier Length 1 – Byte 51

The value returned for this field is 22h if DVCID is set to 1, which indicates that the length of the Device Identifier field is 34 (22h) bytes, excluding this byte. If DVCID is 0, the value for this field is set to 0.

Device Identifier 1 – Bytes 52 though 85

This field contains the tape drive's device identifier from the INQUIRY Device Identification page (page code 83h), starting at byte 8, as returned by the tape drive. Refer to the tape drive's documentation for additional information.

Code Set 2 – Byte 86, Bits 3 through 0

The value returned for this field is 1h, which indicates that the Device Identifier 2 field (bytes 90 through 97) contains binary data.

Note: If the tape drive is a SCSI device, the value for this field is 0. If the DVCID bit in the CDB is 0, this field is omitted.

Identifier Type 2 – Byte 87, Bits 3 through 0

The value returned for this field is 2h, which indicates that the Device Identifier 2 field contains a 64-bit canonical form IEEE Extended Unique Identifier.

Note: If the tape drive is a SCSI device, the value for this field is 0. If the DVCID bit in the CDB is 0, this field is omitted.

Identifier Length 2 – Byte 89

The value returned for this field is 08h, which indicates that the length of the Device Identifier 2 field is 8 bytes.

Note: If the DVCID bit in the CDB is 0, this field is omitted.

Device Identifier 2 – Bytes 90 through 97

The value returned for this field is 0.

Note: If the DVCID bit in the CDB is 0, this field is omitted.

Tape Drive Serial Number – Bytes 98 through 107 (Obsolete)

Note: This field is obsolete and only retained for compatibility. The DVCID field should be used to match drives to libraries according to their Identification Descriptors from Inquiry page 83h.

When either the S/N Req bit (described on page 15-3) is set to 1, the Tape Drive Serial Number field contains the ten-byte tape drive serial number.

If the installed tape drive supports the extended data, the ten-byte tape drive serial number (as received from the tape drive via the serial port) is appended to the standard data transfer element descriptor. If the library receives a READ ELEMENT STATUS command before it has queried the tape drive, this field contains UNKNOWN. If the tape drive does not support returning its serial number to the library, this field contains ten blanks.

15.3.8 ASC AND ASCQ VALUES FOR ABNORMAL STATES

Table 15-2 contains a list of the ASC and ASCQ values that will appear in the Additional Sense Code and Additional Sense Code Qualifier fields of an element descriptor if the element is in an abnormal state. Table 15-2 also indicates the corrective action for each abnormal state. The Except field of an element descriptor indicates if the element is in an abnormal state.

Table 15-2 *ASC and ASCQ values for abnormal element conditions*

ASC	ASCQ	Description	Corrective Action
83h	00h	Label questionable	The bar code label is questionable. Issue an INITIALIZE ELEMENT STATUS (07h) or INITIALIZE ELEMENT STATUS WITH RANGE (37h) command.
83h	01h	Cannot read bar code label or invalid checksum value	Replace the label as described in the *Magnum 224, StorageLibrary T24, or StorageLoader 2U LTO Library Product Manual* or the *Magnum 448 LTO Library Product Manual*. If the error still occurs and the label is correctly placed, contact your vendor. For specifications for the bar code labels that can be used with the library, refer to the *Tandberg Data Bar Code Label Specification for LTO Ultrium Cartridges*.
83h	03h	Label and full status questionable	The library was powered on or the cartridge access port door was opened. The cartridge inventory may have been violated. Issue an INITIALIZE ELEMENT STATUS (07h) or INITIALIZE ELEMENT STATUS WITH RANGE (37h) command. **Note:** If the element is a tape drive that is empty or contains a data cartridge (not ejected), issuing an INITIALIZE ELEMENT STATUS or INITIALIZE ELEMENT STATUS WITH RANGE will not change the questionability of the full status. You may want to issue an UNLOAD command to the tape drive to determine whether the tape drive is full or empty.
83h	04h	Tape drive not installed	There is no tape drive installed. Install a tape drive or ignore the error.
83h	09h	No bar code label	If the cartridge does not have a bar code label, place a label on the cartridge as described in the *Magnum 224, StorageLibrary T24, or StorageLoader 2U LTO Library Product Manual* or the *Magnum 448 LTO Library Product Manual*. If there is a bar code label and it is placed correctly, contact your vendor. For specifications for the bar code labels that can be used with the library, refer to the *Tandberg Data Bar Code Label Specification for LTO Ultrium Cartridges*.

15.4 COMMAND STATUS

The library returns a status byte after processing the READ ELEMENT STATUS command. This section describes when each type of status byte might be returned.

Good

The library returns Good status when it is able to process the command without errors.

Busy

Busy status indicates that the library is temporarily unable to accept a command from this initiator. The initiator may retry the command later.

Reservation Conflict

The library returns Reservation Conflict status when it is reserved by a different initiator. See Chapter 20 for more information about the RESERVE command.

Check Condition

The library returns Check Condition status for the following reasons:

- The command is issued to an invalid LUN.
- A Unit Attention condition is pending for the initiator.
- The library is not ready because a magazine is removed.
- A reserved bit is set to 1 in the CDB.
- A parameter in the CDB is invalid (see Table 15-3 for sense data).

Table 15-3 *Invalid parameters in the READ ELEMENT STATUS CDB*

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	21h	01h	1	1	0	0	0002h	Invalid starting element address.
5h	24h	00h	1	1	1	—	—	A reserved bit is set in the CDB. The pointers point to the bit in error.
5h	24h	00	1	1	1	3h	0001h	Invalid element type code.

16

RECEIVE DIAGNOSTIC RESULTS (1Ch)

Bit Byte	7	6	5	4	3	2	1	0
00	0	0	0	1	1	1	0	0
01	Reserved							
02	Reserved							
03	(MSB)	Allocation Length						
04								(LSB)
05	0	0	Reserved				0	0

16.1 About This Command

You can use the RECEIVE DIAGNOSTIC RESULTS command to retrieve the results of the self-test requested by a previous SEND DIAGNOSTIC (1Dh) command. See Chapter 24 for a description of the self-test.

Note: To ensure that the diagnostic results are up-to-date and accurate, be sure that the RECEIVE DIAGNOSTIC RESULTS command immediately follows the SEND DIAGNOSTIC command and that the tape drive is reserved for the initiator's exclusive use. If there are any intervening commands between the SEND DIAGNOSTIC and the RECEIVE DIAGNOSTIC RESULTS command, the information returned may not be valid.

16.2 WHAT YOU SEND TO THE LIBRARY

Bytes 03 and 04 – Allocation Length

This field specifies the number of bytes that the initiator has allocated for the return of RECEIVE DIAGNOSTICS RESULTS data. The library returns only one diagnostic page per command.

Table 16-1 lists the diagnostic pages returned by the RECEIVE DIAGNOSTIC command and their maximum page lengths. Setting the Allocation Length to 0 indicates that no diagnostic data will be returned and is not an error.

Table 16-1 *Maximum page length of each supported RECEIVE DIAGNOSTIC page*

Page Code	Page Name	Maximum Length[a]
00h	Supported Diagnostic Pages page	20h (32 bytes)
F0h	Self Test page	400h (1,024 bytes)
FFh	No Diagnostic Results Available page	04h (4 bytes)

[a] This maximum length value includes the four-byte Diagnostic Parameter header sent with each page.

The library terminates the Data In phase when the number of bytes specified in the Allocation Length field has been transferred or when all available data has been transferred to the initiator, whichever is less.

16.3 WHAT THE LIBRARY RETURNS

When the library receives a RECEIVE DIAGNOSTIC RESULTS command, it returns the results of the previous SEND DIAGNOSTIC command. Each page of the diagnostic data begins with a four-byte Diagnostic Parameter Header (bytes 00 through 03), followed by the diagnostic parameters for that page. The Diagnostic Parameter Header indicates the page code for the diagnostic parameter data being returned and indicates the total length of the data to follow.

Bit / Byte	7	6	5	4	3	2	1	0
00	Page Code							
01	Reserved							
02	(MSB) Page Length							
03								(LSB)

Byte 00 – Page Code

This field identifies the page code of the diagnostic for which the tape drive is returning data. Table 16-1 lists the valid page codes.

Bytes 02 and 03 – Page Length

This field indicates the total number of bytes that will follow this byte if the Allocation Length specified in the CDB is sufficient. The value returned for this field depends on the value of the Page Code field.

Byte 04 – Diagnostic Parameters

This field contains the data resulting from the diagnostic test indicated by the Page Code field. The data returned for each diagnostic page is described in the following sections.

16.3.1 SUPPORTED DIAGNOSTIC PAGES (PAGE CODE 00h)

When the value of the Page Code field (byte 00) in the Diagnostic Parameter Header is 00h, the data that follows is the Supported Diagnostic Pages page. This page lists the page codes for all of the diagnostic pages included in the data being returned.

Bit / Byte	7	6	5	4	3	2	1	0
00	Page Code (00h)							
01	Reserved							
02	(MSB)			Page Length (0018h)				
03								(LSB)
04	Supported Diagnostic Pages (Page Code 00h)							
05 ... 26	Tandberg Data Internal							
27	Self Test (Page Code F0h)							

Page Code – Byte 00

The value returned for this field is 00h, which is the Page Code for the Supported Diagnostics Pages page.

Page Length – Bytes 02 and 03

The value returned for this filed is 0018h, indicating that the library returns an additional 24 bytes of data follow this field.

Supported Log Pages – Byte 04

The value returned for this field is 00h, which indicates support for the Supported Diagnostics Pages page.

Tandberg Data Internal – Bytes 05 through 26

The page codes listed in the bytes marked "Tandberg Data Internal" contain proprietary information for use by the library's engineering staff only. No diagnostic data is returned for these pages.

Self Test – Byte 27

The value returned for this field is F0h, which indicates support for the Self Test page.

16.3.2 SELF TEST PAGE (PAGE CODE F0h)

When the value of the Page Code field (byte 00) in the Diagnostic Parameter Header is F0h, the data that follows contains the results from a self-test request issued using the SEND DIAGNOSTIC command or from a previous self-test (or POST), if still available.

Bit / Byte	7	6	5	4	3	2	1	0
00	Page Code (F0h)							
01	Reserved							
02	(MSB) Page Length (0400h)							
03	Page Length (0400h) (LSB)							
04 ... *nn*	Self Test Results							

Page Code – Byte 00

The value returned for this field isF0h, which is the Page Code for the Self Test page.

Page Length – Bytes 02 and 03

The value returned for this filed is always 0400h indicating that the library returns an additional 1,024 bytes of self test data follow this field.

Bytes 4 through *nn* – Self Test Results

The Self Test Results field contains ASCII text that describes the success or failure of the component tests run during the self-test. If the length of the ASCII text is less than 1,024 bytes, the remainder of the field is filled with zeros.

Technical Support may request that you generate this data and send it to them for analysis.

16.3.3 NO DIAGNOSTIC RESULTS AVAILABLE PAGE (PAGE CODE FFh)

When the value of the Page Code field (byte 00) in the Diagnostic Parameter Header is FFh, no additional data follows. The library returns this page if there are no diagnostic results available. The library also returns this page if it has not previously received a SEND DIAGNOSTIC command or if an intervening command has corrupted the diagnostic data.

Bit / Byte	7	6	5	4	3	2	1	0
00	Page Code (FFh)							
01	Reserved							
02	(MSB) Page Length (0000h)							
03	Page Length (0000h) (LSB)							

Page Code – Byte 00

The value returned for this field is FFh, which is the Page Code for the No Diagnostic Results Available Page page.

Page Length – Bytes 02 and 03

The value returned for this filed is always 0000h indicating that there is no diagnostic data to be returned.

16.4 COMMAND STATUS

The library returns a status byte after processing the RECEIVE DIAGNOSTIC RESULTS command. This section describes when each type of status byte might be returned.

Good

The library returns Good status when it is able to process the command without errors.

Busy

Busy status indicates that the library is temporarily unable to accept a command from this initiator. The initiator may retry the command later.

Reservation Conflict

The library returns Reservation Conflict status when it is reserved by a different initiator. See Chapter 20 for more information about the RESERVE command.

Check Condition

The library returns Check Condition status for the following reasons:

- The command is issued to an invalid LUN.
- A Unit Attention condition is pending for the initiator.
- A reserved bit is set to 1 in the CDB.
- A parameter in the CDB is invalid (see Table 16-2 for sense data).

Table 16-2 *Invalid parameters in the READ ELEMENT STATUS CDB*

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	24h	00h	1	1	1	—	—	A reserved bit is set in the CDB. The pointers point to the bit in error.

17

RELEASE (17h OR 57h)

SIX-BYTE CDB (17h)

Bit Byte	7	6	5	4	3	2	1	0
00	0	0	0	1	0	1	1	1
01	Reserved							
02								
03								
04								
05	0	0	Reserved				0	0

TEN-BYTE CDB (57h)

Bit Byte	7	6	5	4	3	2	1	0
00	0	1	0	1	0	1	1	1
01	Reserved			3rdPty	Reserved		LongID	RSVD
02	Reserved							
03	Third Party Device ID							
04 ... 09	Reserved							

Note: The RESERVE and RELEASE commands, while targeting the library, are actually specified by the ADI and handled by the tape drive.
For additional information, see:
The tape drive *Product Manual*
The Automation/Drive Interface - Command (ADC)

17.1 ABOUT THIS COMMAND

The library supports both the six-byte and the ten-byte format of the RELEASE UNIT CDB. The library determines which version of the command is being used based on the operation code in the CDB. You can use either version of the command.

The RELEASE command enables you to release reservations of the library that you made with the RESERVE (16h or 56h) command. For information on the RESERVE command, see Chapter 20.

Only the initiator that reserved the library can release the reserved library. If another initiator attempts to release a reserved library, the library returns Good status and does not release the library.

Releasing an unreserved library is not an error.

17.2 WHAT YOU SEND TO THE LIBRARY

17.2.1 SIX-BYTE CDB (PAGE CODE 17h)

Use the six-byte CDB if you want to release reservations for the library.

17.2.2 TEN-BYTE CDB (PAGE CODE 57h)

Use the ten-byte CDB if you want to release reservations for the library.

Byte 01, Bit 4 – 3rdPty

Only a value of 0 is supported.

LongID – Byte 01, Bit 1

The value for this field must always be 0, indicating that the library does not support device IDs greater than 255.

Byte 03 – Third Party Device ID

This field is not supported and must be 0.

17.3 COMMAND STATUS

The library returns a status byte after processing the RELEASE command. This section describes when each type of status byte might be returned.

Good

The library returns Good status when it is able to process the command without errors.

Busy

Busy status indicates that the library is temporarily unable to accept a command from this initiator. The initiator may retry the command later.

Reservation Conflict

The library never returns Reservation Conflict status for the RELEASE command.

Check Condition

The library returns Check Condition status for the following reasons:

- The command is issued to an invalid LUN.
- A Unit Attention condition is pending for the initiator.
- A reserved bit is set to 1 in the CDB.
- A parameter in the CDB is invalid (see Table 17-1 for sense data).

Table 17-1 *Invalid parameters in the RELEASE CDB*

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	24h	00h	1	1	1	—	—	A reserved bit is set in the CDB. The pointers point to the bit in error.
5h	24h	00	1	1	1	1h	0001h	LongID field is set to 1.
5h	24h	00	1	1	1	1h	0000h	Element field is set to 1.

Notes

18

REQUEST SENSE (03h)

Bit Byte	7	6	5	4	3	2	1	0
00	0	0	0	0	0	0	1	1
01	Reserved							
02	Reserved							
03								
04	Allocation Length							
05	0	0	Reserved				0	0

Notes:

- The sense data is sent from the library to the tape drive, along with status, over the ADI when the requested SCSI command is completed by the library.
- When sense data is requested, the tape drive may return this status or choose to override it with its own.
- For additional information, see:
  - The tape drive *Product Manual*
  - *The Automation/Drive Interface - Command (ADC)*

18.1 About This Command

The REQUEST SENSE command requests that the library transfer sense data to the initiator. The library provides sense data in only the Error Code 70h, extended sense data format. The library returns a total of 20 bytes of sense data to the initiator.

The sense data is constructed and saved on a per-initiator and requested LUN basis. The library preserves sense data for all initiators until the data is retrieved by the REQUEST SENSE command or until the library receives any other command for the same I_T_L nexus (initiator-target-LUN connection).

Sense data is available under the following circumstances:

- The previous command to the specified I_T_L nexus terminated with Check Condition status.
- The previous command to the specified I_T_L nexus terminated with an unexpected bus free error.
- The REQUEST SENSE command was issued to an unsupported LUN. In this case, the library does not return Check Condition status and returns the following sense data:

Sense key	Illegal Request (5h)
ASC	Logical unit not supported (25h)
ASCQ	00h

If no sense data is available for the specified I_T_L nexus, the library returns the following sense data:

Sense key	No Sense (0h)
ASC	No additional sense information (00h)
ASCQ	00h

18.2 WHAT YOU SEND TO THE LIBRARY

Allocation Length – Byte 04

This field indicates the number of bytes that the initiator has allocated for returned sense data. The library provides a total of 14h (20) bytes of sense data.

18.3 WHAT THE LIBRARY RETURNS

The library returns the standard extended sense bytes, as described below.

Bit Byte	7	6	5	4	3	2	1	0
00	RSVD	1	1	1	0	0	0	0
01	00h							
02	0	0	0	RSVD	Sense Key			
03 ... 06	(MSB) Information Bytes (LSB)							
07	Additional Sense Length							
08 ... 11	(MSB) Command Specific Information (LSB)							
12	Additional Sense Code (ASC)							
13	Additional Sense Code Qualifier (ASCQ)							
14	Field Replaceable Unit Code							
15	SKSV	(MSB) Sense Key Specific						
16								
17								(LSB)
18	Fault Symptom Code (FSC)							
19	FSC Command							

Sense Key – Byte 02, Bits 3 through 0

Table 18-1 contains descriptions of the sense key values supported by the library.

Table 18-1 *Sense key descriptions*

Hex Value	Sense Key	Description
0h	No Sense	Indicates that there is no specific sense key information to be reported for the library.
2h	Not Ready	Indicates that the library is not ready to perform cartridge loader motion commands.

Table 18-1 *Sense key descriptions (continued)*

Hex Value	Sense Key	Description
3h	Medium Error	Indicates that the command terminated with a non-recovered error condition that was probably caused by a flaw in the medium or an error in the recorded data. This sense key may also be returned if the library is unable to distinguish between a flaw in the medium and a specific hardware error (sense key 4h).
4h	Hardware Error	Indicates that the library detected a hardware failure while performing the command or during a self-test. Operator intervention may be required.
5h	Illegal Request	Indicates that there was an illegal parameter in the command descriptor block or in the additional parameters supplied as data for a command, or the library is in the wrong mode to execute the command.
6h	Unit Attention	Indicates that the cartridge inventory may have been violated.
Bh	Aborted Command	Indicates that the library aborted the command. The initiator may be able to recover by trying the command again.

Information Bytes – Bytes 03 through 06

The library does not support this sense field and returns 0.

Additional Sense Length – Byte 07

This byte indicates the total number of sense bytes that follow this byte. The value returned is 0Ch (12 bytes).

Command Specific Information – Bytes 08 through 11

This field is not supported by the library. The value returned is 0.

Additional Sense Code (ASC) – Byte 12

This field, together with the Additional Sense Code Qualifier (byte 13), denotes a specific error condition.

Additional Sense Code Qualifier (ASCQ) – Byte 13

This field, together with the Additional Sense Code (byte 12), denotes a specific error condition.

Field Replaceable Unit Code – Byte 14

This field is not supported by the library. The value returned is 0.

SKSV (Sense Key Specific Valid) – Byte 15, Bit 7

When this bit is set to 1, the information in the Sense Key Specific field is valid. The SKSV field can be set to 1 only for a sense key of Illegal Request (5h).

Sense Key Specific – Byte 15, Bits 6 through 0; Bytes 16 and 17

When the SKSV bit is set to 1, the information contained in this field indicates which field in the CDB or parameter list of a command caused the Check Condition status. This field, valid only for a sense key of Illegal Request (5h), is defined as follows:

Bit Byte	7	6	5	4	3	2	1	0
15	SKSV	C/D	Reserved		BPV	Bit Pointer		
16	(MSB)	Field Pointers						
17								(LSB)

C/D (Command/Data) – Byte 15, Bit 6 Indicates whether the Check Condition status resulted from an illegal parameter in either the command descriptor block (Command) or the parameter list (Data) of a particular command, as follows:

0	The Check Condition status resulted from an illegal parameter in the parameter list (Data)
1	The Check Condition status resulted from an illegal parameter in the command descriptor block (Command)

BPV (Bit Pointer Valid) – Byte 15, Bit 3 Indicates whether the value in the Bit Pointer field is valid, as follows:

0	The value contained in the Bit Pointer is not valid
1	The value contained in the Bit Pointer (byte 15, bits 2 through 0) is valid

The value in the Bit Pointer field is valid when the field of the CDB or parameter list that caused the error is less than one byte long.

Bit Pointer – Byte 15, Bits 2 through 0 Specifies the bit of the byte identified by the Field Pointer (bytes 16 and 17). When a multiple-bit field is in error, the Bit Pointer contains the value of the most significant bit of the field. The most significant bit of a multiple-bit field is the bit with the highest bit number. For example, if a field consists of bits 5, 4, and 3, the most significant bit is bit 5.

Field Pointer – Bytes 16 and 17 Contains the number of the byte in which the error occurred. Byte numbers start at 00. When a multiple-byte field is in error, the Field Pointer contains the value of the most significant byte of the field. The most significant byte of a multiple-byte field is the byte with the lowest byte number. For example, if a field consists of bytes 02, 03, and 04, the most significant byte is byte 02.

18.3.1 PRIORITIES OF SENSE BYTES

Multiple errors may occur during the processing of a single SCSI command. The sense key reflects the last error that occurred. For example, if a message error occurs after an unrecoverable hardware error, the library handles the errors in the following manner:

- The message error is reported.
- A subsequent REQUEST SENSE command reports the hardware error.
- The hardware error is preserved, and the next motion command issued by any host terminates with Check Condition status.

18.3.2 SENSE BYTE PENDING STATUS

When the library reports Check Condition status in response to a command from an initiator, the library retains the sense byte pending status, including error information and Check Condition status for the initiator, until one of the following occurs:

- Error information is reset by a reset or power-on condition.
- Error information is reset by the next command execution for the same initiator.

18.4 COMMAND STATUS

The library returns a status byte after processing the REQUEST SENSE command. This section describes when each type of status byte might be returned.

Good

The library returns Good status when it is able to process the command without errors.

Busy

The library never returns Busy status for the REQUEST SENSE command.

Reservation Conflict

The library never returns Reservation Conflict status for the REQUEST SENSE command.

Check Condition

The library returns Check Condition status for the following reasons:

- A reserved bit is set to 1 in the CDB.
- A parameter in the CDB is invalid (see Table 18-2 for sense data).

Table 18-2 *Invalid parameters in the READ ELEMENT STATUS CDB*

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	24h	00h	1	1	1	—	—	A reserved bit is set in the CDB. The pointers point to the bit in error.

19

REQUEST VOLUME ELEMENT ADDRESS (B5h)

Bit Byte	7	6	5	4	3	2	1	0
00	1	0	1	1	0	1	0	1
01	Reserved			VolTag	Element Type Code			
02	(MSB)	Starting Element Address						
03								(LSB)
04	(MSB)	Number of Elements						
05								(LSB)
06	Reserved							
07	(MSB)	Allocation Length						
08								
09								(LSB)
10	Reserved							
11	0	0	Reserved				0	0

19.1 ABOUT THIS COMMAND

The REQUEST VOLUME ELEMENT ADDRESS command requests that the library return the element descriptors created as a result of the SEND VOLUME TAG (B6h) command. Data is returned in element address order. For information about the SEND VOLUME TAG command, see Chapter 23.

Note: In a multi-initiator environment, you should reserve the entire library using the RESERVE (16h or 56h) command before you request element descriptors. Do not issue the RELEASE (17h or 57h) command until after you have successfully obtained data with the REQUEST VOLUME ELEMENT ADDRESS command. You should issue commands in the following order:

1. RESERVE (16h) for the entire library
2. SEND VOLUME TAG (B6h)
3. REQUEST VOLUME ELEMENT ADDRESS (B5h)
4. RELEASE (17h)

19.2 WHAT YOU SEND TO THE LIBRARY

VolTag – Byte 01, Bit 4

This field indicates whether you want the library to return the volume tag (bar code label) information searched for by the SEND VOLUME TAG (B6h) command. Volume tag information is obtained when the library scans the bar code label affixed to each cartridge in the library. The valid values for this field are as follows:

0	Do not report volume tag information
1	Report volume tag information

Note: For specifications for the bar code labels that can be used with the library, refer to the *Tandberg Data Bar Code Specification for LTO Ultrium Cartridges*.

Element Type Code – Byte 01, Bits 3 through 0

This field specifies the particular element types you want the library to report on. The library supports the following Element Type Codes:

0h	All element types
1h	Medium Transport Element (cartridge loader)
2h	Storage Element (cartridge cells)
3h	I/E Port Element (cartridge access port)
4h	Data Transfer Element (tape drives)

For an Element Type Code of 0h, the element types are reported in element address order, beginning with the Starting Element Address.

Starting Element Address – Bytes 02 and 03

This field indicates the element address at which to start the transfer of data. Only elements with addresses greater than or equal to the starting address are reported. Element descriptor blocks are not generated for undefined element addresses.

Number of Elements – Bytes 04 and 05

This field represents the actual number of element descriptors to be returned. This is an actual number of element descriptors to be returned, not an element address range.

The library returns element descriptors of the requested element type, starting with the first element address equal to or greater than the value in the Element Address field. All element descriptors are returned for the number of element descriptors specified in this field, or the number of element descriptors available, whichever is less.

It is not an error to specify 0FFFFh as a value for this field if you want the library to return all available elements.

Allocation Length – Bytes 07 through 09

The Allocation Length specifies the total available length in bytes you are allocating for returned element descriptors. Only complete element descriptors are returned. The library returns element descriptors until *one* of the following conditions is met:

- All available element descriptors have been returned.
- The number of element descriptors specified in the Number of Elements field has been returned.
- The remaining allocation length is smaller than the next complete element descriptor or header to be returned.

19.3 WHAT THE LIBRARY RETURNS

19.3.1 VOLUME ELEMENT ADDRESS HEADER

The library returns one Volume Element Address Header for each REQUEST VOLUME ELEMENT ADDRESS command that it receives.

Bit Byte	7	6	5	4	3	2	1	0
00	(MSB) First Element Address Reported							
01								(LSB)
02	(MSB) Number of Elements Reported							
03								(LSB)
04	Reserved			Send Action Code				
05	(MSB) Byte Count of Report Available							
06								
07								(LSB)

First Element Address Reported – Bytes 00 and 01

This field indicates the address of the first element that has a bar code label that matches the template sent by the SEND VOLUME TAG (B6h) command.

Number of Elements Reported – Bytes 02 and 03

This field indicates the total number of element descriptors available to be transferred to the initiator. The status of these elements is returned if a sufficient Allocation Length value was specified in the CDB.

Send Action Code – Byte 04, Bits 4 through 0

This field contains the action code in the SEND VOLUME TAG command that created the data. The library supports a Send Action Code of 5h.

Byte Count of Report Available – Bytes 05 through 07

This field indicates the total number of bytes of information available to be transferred to the initiator. This value is not adjusted to match the Allocation Length.

19.3.2 ELEMENT STATUS PAGE

The library returns one Element Status page for each group of element descriptors of the same type.

Bit Byte	7	6	5	4	3	2	1	0
00	Element Type Code							
01	PVolTag	AVolTag	Reserved					
02	(MSB) Element Descriptor Length							
03	(LSB)							
04	Reserved							
05	(MSB) Byte Count of Descriptor Data Available							
06								
07	(LSB)							

Element Type Code – Byte 00

This field indicates the specific element type (see page 19-2) being reported by the element descriptor.

PVolTag – Byte 01, Bit 7

This field indicates if primary volume tag (bar code label) information is present, as follows:

0	Volume tag bytes are omitted from the element descriptors
1	Volume tag information is present

AVolTag – Byte 01, Bit 6

The library does not support alternate volume tags. The value reported for this field is 0.

Element Descriptor Length – Bytes 02 and 03

This field indicates the total number of bytes contained in a single element descriptor, as follows:

- If the descriptor being returned is for either the medium transport element (the cartridge loader) or a storage element (cartridge cell), the length is either 52 bytes (if the VolTag bit is 1) or 16 bytes (if the VolTag bit is 0).

- If the descriptor being returned is for a data transfer element (a tape drive), the element descriptor length changes depending on the setting of the DVCID, VolTag, and S/N Req bits, as shown in Table 19-1.

Table 19-1 *Element descriptor length for the data transfer element*

VolTag	Element Descriptor Length (bytes)
0	16
1	52

Byte Count of Descriptor Data Available – Bytes 05 through 07

This field indicates the total number of bytes of element descriptor data available for the elements of this element type that meet the CDB requirements. This value is not adjusted to match the value that you specified for the Allocation Length field. This value is the Element Descriptor Length multiplied by the number of element descriptors.

19.3.3 ELEMENT DESCRIPTORS

The following sections contain the field definitions for the types of elements in the library:

- **Medium transport element:** The cartridge loader
- **Storage elements:** The cartridge cells
- **I/E port element**: The cartridge access port
- **Data transfer element:** The tape drives

Each element descriptor includes the element address and status flags. Each element descriptor may also contain sense code information as well as other information, depending on the element type.

Notes:

- The element descriptors for the types of elements are very similar, with the exception of a few of the fields. Note the differences in bytes 06 and 07.
- The library does not support alternate volume tags. This information is not included in any of the element descriptors.

19.3.4 MEDIUM TRANSPORT ELEMENT DESCRIPTOR

The medium transport element is the cartridge loader (robot). The library contains one cartridge loader.

Bit Byte	7	6	5	4	3	2	1	0
00	(MSB) Element Address							
01								(LSB)
02	Reserved					Except	RSVD	Full
03	Reserved							
04	Additional Sense Code							
05	Additional Sense Code Qualifier							
06	Reserved							
07								
08								
09	SValid	Invert	Reserved					
10	(MSB) Source Storage Element Address							
11								(LSB)
12 ... 47	Primary Volume Tag Information (field omitted if PVolTag = 0)							
48 ... 51	Reserved (field moved up if PVolTag = 0)							

Element Address – Bytes 00 and 01

This field contains the element address of the medium transport element (cartridge loader).

Except – Byte 02, Bit 2

The Except (exception) bit indicates the current state of the cartridge loader, as follows:

0	The cartridge loader is in a normal state
1	The cartridge loader is in an abnormal state and the Additional Sense Code and the Additional Sense Code Qualifier fields contain information regarding the abnormal state

Full – Byte 02, Bit 0

This field indicates whether the cartridge loader contains a cartridge. Since no match could have been made if there were no cartridge present, the value for this field is always 1.

Additional Sense Code (ASC) – Byte 04

If the cartridge loader is in an abnormal state, this field contains the value 83h. Refer to Table 19-2 for the corresponding ASCQ values and a corrective action for each abnormal state.

Additional Sense Code Qualifier (ASCQ) – Byte 05

The values for this field are listed in Table 19-2, along with the corrective action to take for each abnormal state.

SValid – Byte 09, Bit 7

This bit is set as follows:

0	The Source Storage Element Address field (bytes 10 and 11) is invalid
1	The Source Storage Element Address field (bytes 10 and11) is valid

Invert – Byte 09, Bit 6

The library uses single-sided media and does not support inverting of the media. The information reported for this field is 0.

Source Storage Element Address – Bytes 10 and 11

This field shows the address of the last storage element from which the cartridge was moved.

Primary Volume Tag Information – Bytes 12 through 47

When the PVolTag field (in the Element Status page described on page 19-5) is set to 1, this field contains the volume tag (bar code label) information of the cartridge in the cartridge loader. The library supports eight bytes of volume tag information, so only the first eight bytes reported are valid.

19.3.5 STORAGE ELEMENT DESCRIPTOR

Each of the library's cartridge cells is a storage element. If the library's Limit Number of Cells option is turned on, or if the MaxStor and MaxStorAddr fields are set on the MODE SELECT Unique Properties Page (see page 9-8), the number of storage elements reported is equal to the number of addressable cells specified. See the *Magnum 224, StorageLibrary T24, or StorageLoader 2U LTO Library Product Manual* or the *Magnum 448 LTO Library Product Manual* for more information about changing the number of addressable cells from the LCD.

- **Magnum 224 or T24**—The maximum number of cartridge cells is 24.
- **StorageLoader 2U**—The maximum number of cartridge cells is 20.
- **Magnum 448**—The maximum number of cartridge cells is 48.

Notes:

- **Magnum 224 or T24**—If both the Fixed Cleaning Cell and Auto-Clean flags are set to 1 on the MODE SELECT Cleaning Configuration Page (see page 9-13) is set to 1, the cleaning cell may not be available to SCSI. In this case the maximum number of storage elements is 23 and the value for this field is 17h.

- **StorageLoader 2U**—If both the Fixed Cleaning Cell and Auto-Clean flags are set to 1 on the MODE SELECT Cleaning Configuration Page (see page 9-13) is set to 1, the cleaning cell may not be available to SCSI. In this case the maximum number of storage elements is 19 and the value for this field is 13h.

- **Magnum 448**—If both the Fixed Cleaning Cell and Auto-Clean flags are set to 1 on the MODE SELECT Cleaning Configuration Page (see page 9-13) is set to 1, the cleaning cell may not be available to SCSI. In this case the maximum number of storage elements is 47 and the value for this field is 2Fh.

For each storage element, the library returns the following storage element descriptor.

Bit Byte	7	6	5	4	3	2	1	0
00	(MSB)							
01	Element Address							(LSB)
02	Reserved				Access	Except	RSVD	Full
03	Reserved							
04	Additional Sense Code							
05	Additional Sense Code Qualifier							
06	Reserved							
07								
08								
09	SValid	Invert	Reserved					

10	(MSB)
11	Source Storage Element Address (LSB)
12 ... **47**	Primary Volume Tag Information (field omitted if PVolTag = 0)
48 ... **51**	Reserved (field moved up if PVolTag = 0)

Element Address – Bytes 00 and 01

This field contains the element address of the storage element (cartridge storage cell).

Access – Byte 02, Bit 3

This bit indicates whether the cartridge loader can access the cartridge. The cartridge storage location is always accessible. The valid value for this bit is 1.

Except – Byte 02, Bit 2

The Except (exception) bit indicates the current state of the cartridge cell, as follows:

0	The cartridge cell is in a normal state
1	The cartridge cell is in an abnormal state and the Additional Sense Code and the Additional Sense Code Qualifier fields contain information regarding the abnormal state

Full – Byte 02, Bit 0

This bit indicates whether the cell contains a cartridge. Since no match could have been made if there was no cartridge present, the value for this bit is always 1.

Additional Sense Code (ASC) – Byte 04

If the cell is in an abnormal state, this field contains the value 83h. Refer to Table 19-2 for the corresponding ASCQ values and a corrective action for each abnormal state.

Additional Sense Code Qualifier (ASCQ) – Byte 05

The values for this field are listed in Table 19-2, along with the corrective action to take for each abnormal state.

SValid – Byte 09, Bit 7

This bit is set as follows:

0	The Source Storage Element Address field (bytes 10 and 11) is invalid
1	The Source Storage Element Address field (bytes 10 and 11) is valid

Invert – Byte 09, Bit 6

The library uses single-sided media and does not support inverting of the media (recording on both sides of the tape). The value reported for this bit is 0.

Source Storage Element Address – Bytes 10 and 11

This field shows the address of the last storage element from which the cartridge was moved.

Primary Volume Tag Information – Bytes 12 through 47

When the PVolTag field (in the Element Status page described on page 19-5) is set to 1, this field contains the volume tag (bar code label) information of the cartridge in this storage location. The library supports eight bytes of volume tag information, so only the first eight bytes reported are valid.

19.3.6 IMPORT/EXPORT ELEMENT DESCRIPTOR

If enabled, the library has the following I/E port elements (cartridge access ports), for which it returns the following I/E element descriptor.

- **Magnum 224, T24, or SL 2U**—The library has one I/E port.
- **Magnum 448**—The library has two physical I/E ports, but you can "enable" the library to use zero, one, or two I/E ports through the front panel.

Bit Byte	7	6	5	4	3	2	1	0
00	(MSB) Element Address							
01								(LSB)
02	Reserved		INENAB	EXENAB	Access	Except	IMPEXP	Full
03	Reserved							
04	Additional Sense Code							
05	Additional Sense Code Qualifier							
06	Reserved							
07								
08								

09	SValid	Invert	Reserved
10	(MSB)	Source Storage Element Address	
11			(LSB)
12 ... **47**	Primary Volume Tag Information (field omitted if PVolTag = 0)		
48 ... **51**	Reserved (field moved up if PVolTag = 0)		

INENAB (Import Enable) – Byte 02, Bit 5

This field indicates whether the I/E port element supports movement of media into the cartridge handler.

0	Medium may not be imported into cartridge handler from I/E port
1	Medium may be imported into cartridge handler from I/E port

Since such movement is supported, the value of this bit will always be 1.

EXENAB (Export Enable) – Byte 02, Bit 4

This field indicates whether the I/E port element supports movement of media from the cartridge handler into the I/E port element.

0	Medium may not be exported into the I/E port
1	Medium may be exported into the I/E port

Since such movement is supported, the value of this bit will always be 1.

IMPEXP (Import Export) – Byte 02, Bit 1

This field indicates where the unit of media in the I/E port element originated.

0	Medium in the I/E port was placed there by the cartridge handling system
1	Medium in the I/E port was placed there by the operator

Access – Byte 02, Bit 3

This bit indicates whether the cartridge loader can access the cartridge at that location.

0	The cell is not currently accessible
1	The cell is accessible

Except – Byte 02, Bit 2

The Except (exception) bit indicates the current state of the cartridge cell, as follows:

0	The cartridge cell is in a normal state
1	The cartridge cell is in an abnormal state and the Additional Sense Code and the Additional Sense Code Qualifier fields contain information regarding the abnormal state

Full – Byte 02, Bit 0

This bit indicates whether the cartridge cell contains a cartridge, as follows:

0	The cell does not contain a cartridge
1	The cell contains a cartridge

Additional Sense Code (ASC) – Byte 04

If the Except bit is set to 1, this field contains the value 83h. Refer to Table 19-2 on page 19-18 for the corresponding ASCQ values and a corrective action for each abnormal state.

Additional Sense Code Qualifier (ASCQ) – Byte 05

The values for this field are listed in Table 19-2 on page 19-18, along with the corrective action to take for each abnormal state.

SValid – Byte 09, Bit 7

The values for this bit indicate the following:

0	The Source Storage Element Address field (bytes 10 and 11) is invalid
1	The Source Storage Element Address field (bytes 10 and 11) is valid

Invert – Byte 09, Bit 6

The library uses single-sided media and does not support inverting of the media. The value reported for this field is 0.

Source Storage Element Address – Bytes 10 and 11

This field shows the address of the last storage element from which the cartridge was moved.

Primary Volume Tag Information – Bytes 12 through 47

When the PVolTag field (in the Element Status page described on page 19-5) is set to 1, this field contains the volume tag (bar code label) information of the cartridge in the storage location. The library supports eight bytes of volume tag information, so only the first eight bytes reported are valid.

19.3.7 DATA TRANSFER ELEMENT DESCRIPTOR

The library has the following data transfer elements (tape drives), for which it returns the following data transfer element descriptor.

- **Magnum 224, T24, or SL 2U**—The library may have one or two tape drives installed.
- **Magnum 448**—The library may have one, two, three, or four tape drives installed.

Bit Byte	7	6	5	4	3	2	1	0
00	(MSB)							
01	Element Address							(LSB)
02	Reserved				Access	Except	RSVD	Full
03	Reserved							
04	Additional Sense Code							
05	Additional Sense Code Qualifier							
06	RSVD	RSVD	IDValid	LUValid	RSVD	Logical Unit Number		
07	SCSI Bus Address							
08	Reserved							
09	SValid	Invert	Reserved					
10	(MSB)							
11	Source Storage Element Address							(LSB)

12 **...** **47**	Primary Volume Tag Information (omitted if PVolTag = 0)
48 **...** **51**	Reserved (field moved up if PVolTag = 0)

Element Address – Bytes 00 and 01

This field contains the address of the data transfer element (the tape drive).

- **Magnum 224, T24, or SL 2U**—The library may have one or two tape drives with a default starting address of 51h (81).
- **Magnum 448**—The library may have one, two, three, or four tape drives with a default starting address of 51h (81).

Access – Byte 02, Bit 3

This bit indicates whether the cartridge loader can pick or place a cartridge at the tape drive location. The cartridge is accessible if it is unloaded from the tape drive at that location. Accessibility is reported as follows:

0	The tape drive location may not be accessible (a cartridge was last reported in the tape drive but is not currently unloaded)
1	The tape drive location is accessible (a cartridge is unloaded and waiting to be picked, or the tape drive is empty)

Except – Byte 02, Bit 2

The Except (exception) bit indicates the current state of the tape drive, as follows:

0	The tape drive is in a normal state
1	The tape drive is in an abnormal state and the Additional Sense Code and the Additional Sense Code Qualifier fields contain information regarding the abnormal state

Full – Byte 02, Bit 0

This bit indicates if the tape drive contains a cartridge. Since a match could have been made only if there was a cartridge present, the value for this bit is always 1.

Additional Sense Code (ASC) – Byte 04

If the tape drive is in an abnormal state, this field contains the value 83h. Refer to Table 19-2 for the corresponding ASCQ values and a corrective action for each abnormal state.

Additional Sense Code Qualifier (ASCQ) – Byte 05

The values for this field are listed in Table 19-2, along with the corrective action to take for each abnormal state.

IDValid – Byte 06, Bit 5

This bit indicates that the SCSI Bus Address field (byte 07) contains valid information as follows:

0	The SCSI Bus Address field is not valid because a tape drive is not installed at this location
1	The SCSI Bus Address field is valid because a tape drive is installed at this location

LUValid – Byte 06, Bit 4

This bit indicates that the Logical Unit Number field (byte 06, bits 2 through 0) contains valid information as follows:

0	The Logical Unit Number field is not valid because a tape drive is not installed at this location
1	The Logical Unit Number field is valid because a tape drive is installed at this location

Logical Unit Number – Byte 06, Bits 2 through 0

The value reported for this field is 0.

SCSI Bus Address – Byte 07

The value reported for this field is the tape drive's SCSI ID.

SValid – Byte 09, Bit 7

This bit is set as follows:

0	The Source Storage Element Address field (bytes 10 and 11) is invalid
1	The Source Storage Element Address field (bytes 10 and 11) is valid

Invert – Byte 09, Bit 6

The library uses single-sided media and does not support inverting of the media (recording on both sides of the tape). The value reported for this bit is 0.

Source Storage Element Address – Bytes 10 and 11

This field shows the addresses of the last storage element from which the cartridge was moved.

Primary Volume Tag Information – Bytes 12 through 47

When the PVolTag field (in the Element Status page described in page 19-5) is set to 1, the Primary Volume Tag Information field contains the volume tag information of the cartridge in this tape drive. The library supports eight bytes of volume tag information, so only the first eight bytes reported are valid.

Note: Although the library cannot scan a cartridge loaded in a tape drive, bar code label information can be reported if the cartridge was scanned before it was loaded inside the tape drive. The library obtains this information from the cartridge inventory. Check to see if the Except field (byte 02, bit 2) is set to 1. If it is, the label information reported may be inaccurate because the cartridge inventory is questionable.

19.3.8 ASC AND ASCQ VALUES FOR ABNORMAL STATES

Table 19-2 contains a list of the ASC and ASCQ values that appear in the Additional Sense Code and Additional Sense Code Qualifier fields of an element descriptor if the element is in an abnormal state. Table 19-2 also indicates the corrective action for each abnormal state. The Except field of an element descriptor indicates if the element is in an abnormal state.

Table 19-2 *ASC and ASCQ values for abnormal element conditions*

ASC	ASCQ	Description	Corrective Action
83h	00h	Label questionable	▪ The bar code label is questionable. Issue an INITIALIZE ELEMENT STATUS (07h or 37h) command to reread the label. ▪ Replace the label. Refer to the *Magnum 224, StorageLibrary T24, or StorageLoader 2U LTO Library Product Manual* or the *Magnum 448 LTO Library Product Manual* for information about placing the labels on the cartridges. For specifications for the bar code labels that can be used with the library, refer to the *Tandberg Data Bar Code Specification for LTO Ultrium Cartridges*. ▪ If the error persists, contact your service provider.
83h	01h	Cannot read bar code label	▪ Replace the label. Refer to the *Magnum 224, StorageLibrary T24, or StorageLoader 2U LTO Library Product Manual* or the *Magnum 448 LTO Library Product Manual* for information about placing the labels on the cartridges. For specifications for the bar code labels that can be used with the library, refer to the *Tandberg Data Bar Code Specification for LTO Ultrium Cartridges*. ▪ If the error persists and the label is properly placed, contact your service provider.
83h	03h	Label and full status questionable	The library was powered on or the cartridge access port door was opened. The cartridge inventory may have been violated. Issue an INITIALIZE ELEMENT STATUS (07h or 37h) command to reestablish the cartridge inventory.
83h	09h	No bar code label	▪ If the cartridge does not have a bar code label, place a label on the cartridge. Refer to the *Magnum 224, StorageLibrary T24, or StorageLoader 2U LTO Library Product Manual* or the *Magnum 448 LTO Library Product Manual* for information about placing the labels on the cartridges. For specifications for the bar code labels that can be used with the library, refer to the *Tandberg Data Bar Code Specification for LTO Ultrium Cartridges*. ▪ If error persists and a label is present and properly placed, contact your service provider.

19.4 COMMAND STATUS

The library returns a status byte after processing the REQUEST VOLUME ELEMENT ADDRESS command. This section describes when each type of status byte might be returned.

Good

The library returns Good status when it is able to process the command without errors.

Busy

Busy status indicates that the library is temporarily unable to accept a command from this initiator. The initiator may retry the command later.

Reservation Conflict

The library returns Reservation Conflict status when it is reserved by a different initiator. See Chapter 20 for more information about the RESERVE command.

Check Condition

The library returns Check Condition status for the following reasons:

- The command is issued to an invalid LUN.
- A Unit Attention condition is pending for the initiator.
- A reserved bit is set to 1 in the CDB.
- The library is not ready because a magazine is removed or the library is operating in panel mode.
- A parameter in the CDB is invalid (see Table 19-3 for sense data).

Table 19-3 *Invalid parameters in the REQUEST VOLUME ELEMENT ADDRESS CDB*

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	24h	00h	1	1	1	—	—	A reserved bit is set in the CDB. The pointers point to the bit in error.
5h	21h	01h	1	1	0	0	0002h	Invalid starting element address.
5h	24h	00h	1	1	1	3h	0001h	Invalid element type code.

Notes

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RESERVE (16h OR 56h)

SIX-BYTE CDB (16h)

Bit Byte	7	6	5	4	3	2	1	0
00	0	0	0	1	0	1	1	0
01	Reserved							
02								
03								
04								
05	0	0	Reserved				0	0

TEN-BYTE CDB (56h)

Bit Byte	7	6	5	4	3	2	1	0
00	0	0	0	1	0	1	1	0
01	Reserved							
02								
03	Third Party Device ID							
04 ... 06	Reserved							
07	(MSB) Parameter List Length							
08								(LSB)
09	0	0	Reserved				0	0

Note: The RESERVE and RELEASE commands, while targeting the library, are actually specified by the ADI and handled by the tape drive.
For additional information, see:
The tape drive *Product Manual*
The Automation/Drive Interface - Command (ADC)

20.1 ABOUT THIS COMMAND

The RESERVE command allows the initiator to reserve the library. The tape drive must be reserved separately.

The library supports both the six-byte and the ten-byte format of the RESERVE UNIT CDB. The library determines which version of the command is being used based on the operation code in the CDB. You can use either version of the command.

Reservations can be released with a RELEASE (17h or 57h) command from the same initiator (see Section 17.1 on page 17-2), a reset, or a power-on of the library.

Notes:

- If the library is reserved as a unit, the library processes only the following commands from another initiator:
  - INQUIRY
  - RELEASE
  - REQUEST SENSE
  - PREVENT/ALLOW MEDIUM REMOVAL with Prevent=00b

  All other commands result in a Reservation Conflict (18h) status.

20.2 WHAT YOU SEND TO THE LIBRARY

20.2.1 SIX-BYTE CDB (PAGE CODE 16h)

Use the six-byte CDB if you want to reserve the library.

20.2.2 TEN-BYTE CDB (PAGE CODE 56h)

Use the ten-byte CDB if you want to reserve the library.

LongID – Byte 01, Bit 1

The value for this field must always be 0, indicating that the library does not support device IDs greater than 255.

Byte 03 – Third Party Device ID

This field is not supported and must be set to 0.

Parameter List Length – Byte 07 and 08

Long ID and element reservation are not supported for this command, so value for this field must always be 0.

20.3 COMMAND STATUS

The library returns a status byte after processing the RESERVE command. This section describes when each type of status byte might be returned.

Good

The library returns Good status when it is able to process the command without errors.

Busy

Busy status indicates that the library is temporarily unable to accept a command from this initiator. The initiator may retry the command later.

Reservation Conflict

The library returns Reservation Conflict status when it is reserved by a different initiator. See Chapter 20 for more information about the RESERVE command.

Check Condition

The library returns Check Condition status for the following reasons:

- The command is issued to an invalid LUN.
- A Unit Attention condition is pending for the initiator.
- A reserved bit is set to 1 in the CDB.
- A parameter in the CDB or element descriptor data is invalid (see Table 20-1 for sense data).

Table 20-1 *Invalid parameters in the RESERVE CDB and element descriptor data*

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	1Ah	00h	1	1	0	0	0003h	Invalid Element List Length.
5h	24h	00h	1	1	1	3h	0001h	Error in Third Party Device field.
5h	24h	00h	1	1	1	4h	0001h	Error in 3rdPty field.
5h	26h	00h	1	1	1	—	—	A reserved bit is set in the CDB. The pointers point to the bit in error.
5h	26h	00h	1	0	0	0	0000h[a]	Reserved field not 0.
5h	26h	00h	1	0	0	0	0001h[a]	Reserved field not 0.

Table 20-1 *Invalid parameters in the RESERVE CDB and element descriptor data*

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	26h	02h	1	0	0	0	—[b]	Overlapped element address in element list descriptor.
5h	26h	02h	1	0	0	0	0004h[a]	Invalid element address.
5h	26h	02h	1	1	0	0	0002h[a]	Element reservation attempted when LUN is already reserved by this initiator.

[a] You can send more than one Element List Descriptor at a time. Add six to this field pointer value for each subsequent descriptor.

[b] The Field Pointer depends on the number of element descriptors sent.

21

REZERO UNIT (01h)

Bit Byte	7	6	5	4	3	2	1	0
00	0	0	0	0	0	0	0	1
01	Reserved							
02								
03								
04								
05								

21.1 About This Command

The REZERO UNIT command is implemented to provide software compatibility when it is required. Because the library does not need to calibrate its mechanics, it always returns an immediate Good status in response to this command.

21.2 Command Status

The library returns a status byte after processing the REZERO UNIT command. This section describes when each type of status byte might be returned.

Good

The library always returns Good for this command.

Busy

Busy status indicates that the library is temporarily unable to accept a command from this initiator. The initiator may retry the command later.

Reservation Conflict

The library returns Reservation Conflict status when it is reserved by a different initiator. See Chapter 20 for more information about the RESERVE command.

Check Condition

The library returns Check Condition status for the following reasons:

- The command is issued to an invalid LUN.
- A Unit Attention condition is pending for the initiator.
- The library is not ready because a magazine is removed.
- A reserved bit is set to 1 in the CDB.

22

SEND DIAGNOSTIC (1Dh)

Bit Byte	7	6	5	4	3	2	1	0
00	0	0	0	1	1	1	0	1
01	Reserved			PF	RSVD	SelfTest	DevOfl	UnitOfl
02	Reserved							
03	Parameter List Length							
04								
05	0	0	Reserved				0	0

22.1 About This Command

The SEND DIAGNOSTIC command causes the library to perform its diagnostic self-test. If a test is successful, the library returns Good status; otherwise, it returns Check Condition status. When this command is followed by a RECEIVE DIAGNOSTIC RESULTS (1Ch) command or a REQUEST SENSE (03h) command, the results of the self-test are reported to the initiator.

Notes:

- To ensure that the diagnostic data returned is valid, the SEND DIAGNOSTIC command must be immediately followed by the RECEIVE DIAGNOSTIC RESULTS command.
- To ensure that the results of the diagnostic test are not destroyed by a command sent by another initiator, the library should be reserved for the initiator's exclusive use.
- The initiator must support the disconnect option if you plan to use the SEND DIAGNOSTIC command because the library will disconnect from the initiator while the command is executing.

22.2 WHAT YOU SEND TO THE LIBRARY

Byte 01, Bit 4 – PF (Page Format)

This field specifies whether the format of the parameter list for the SEND DIAGNOSTIC command conforms to the page format defined in the SCSI standard, as follows:

0	The parameter list uses non-page format. This value is only valid if the SelfTest bit (byte 01, bit 2) is set.
1	The parameter list uses the SCSI page format. This value is valid for all pages.

Byte 01, Bit 2 – SelfTest

This bit specifies whether the library should perform its default diagnostic self-test, as follows:

0	Perform the diagnostic tests specified in the Parameter List
1	Preform the default diagnostic self-test. The Parameter List Length must be 0

Byte 01, Bit 1 – DevOffL

This bit specifies whether the library is allowed to perform diagnostic tests whose results may be detected by subsequent I/O processes (for example unit reservations, log parameters, or sense data), as follows:

0	The library may not perform diagnostic tests whose results may be detected by subsequent I/O processes
1	The library may perform diagnostic tests whose results may be detected by subsequent I/O processes

Byte 01, Bit 0 – UnitOffL

This field specifies whether the library is allowed to perform diagnostic tests that might affect the tape, such as writing data or repositioning the tape, as follows:

0	The library may not perform diagnostic test that might affect the tape
1	The library may perform diagnostic test that affect the tape

Bytes 03 and 04 – Parameter List Length

The value for this field specifies the number of bytes of data that follow in the parameter list. The additional data is one of the diagnostic pages described in the following sections. Table 22-1 lists the diagnostic pages supported by the tape drive and the maximum page length of each.

Table 22-1 *Maximum page length of each supported SEND DIAGNOSTIC page*

Page Code	Page Name	Page Length[a]
00h	Supported Diagnostic Pages page	0000h (0 bytes)
F0h	Self Test page	0000h (0 bytes)

[a] Maximum page length does not include the four-byte Diagnostic Parameter Header, which must be included with each page.

22.3 ADDITIONAL DIAGNOSTIC DATA

Following each SEND DIAGNOSTIC CDB is a parameter list for the Diagnostic page you are sending. The parameter list for each diagnostic page begins with a four-byte Diagnostic Parameter Header (bytes 00 through 03), followed by the parameters for that page. The Diagnostic Parameter Header indicates the page code for the diagnostic page and indicates the total length of the parameter list to follow.

Bit / Byte	7	6	5	4	3	2	1	0
00	Page Code							
01	Reserved							
02	(MSB) Page Length							
03								(LSB)

Byte 00 – Page Code

This field identifies the page code of the diagnostic page being sent. Table 22-1 lists the page codes for all of the supported diagnostic pages.

Bytes 02 and 03 – Page Length

This field indicates the total number of bytes that will follow this byte. The valid value for this field depends on the value in the Page Code field. Table 22-1 lists of the page length for each of the supported diagnostic pages.

22.3.1 SUPPORTED DIAGNOSTIC PAGES PAGE (PAGE CODE 00h)

When the value of the Page Code field (byte 00) in the Diagnostic Parameter Header is 00h, the data that follows contains parameters for the Supported Diagnostic Pages page. This page allows the initiator to retrieve the list of supported pages using the RECEIVE DIAGNOSTIC RESULTS command. The value in the Page Length field (bytes 2 and 3) of the Diagnostic Parameter Header for this page is 0000h, indicating that there are no parameters associated with this diagnostic page.

Bit / Byte	7	6	5	4	3	2	1	0
00	Page Code (00h)							
01	Reserved							
02	(MSB) Page Length (0000h)							
03								(LSB)

22.3.2 SELF TEST PAGE (PAGE CODE F0h)

When the value of the Page Code field (byte 00) in the Diagnostic Parameter Header is F0h, the Self Test page is executed by the SEND DIAGNOSTIC command. The value in the Page Length field (bytes 2 and 3) of the Diagnostic Parameter Header is 0000h, indicating that there are no parameters associated with this diagnostic page. This diagnostic page has the same effect as setting the SelfTest bit (byte 1, bit 2) in the CDB.

Bit / Byte	7	6	5	4	3	2	1	0
00	Page Code (F0h)							
01	Reserved							
02	(MSB) Page Length (0000h)							
03								(LSB)

22.4 COMMAND STATUS

The library returns a status byte after processing the SEND DIAGNOSTIC command. This section describes when each type of status byte might be returned.

Good

The library returns Good status when it is able to process the command without errors.

Busy

Busy status indicates that the library is temporarily unable to accept a command from this initiator. The initiator may retry the command later.

Reservation Conflict

The library returns Reservation Conflict status when it is reserved by a different initiator. See Chapter 20 for more information about the RESERVE command.

Check Condition

The library returns Check Condition status for the following reasons:

- The command is issued to an invalid LUN.
- A Unit Attention condition is pending for the initiator.
- The library is not ready because a magazine is removed.
- A reserved bit is set to 1 in the CDB.
- The library encounters a hardware problem while trying to perform the requested test.
- A parameter in the CDB or Send Diagnostic Parameter List is invalid (see Table 22-2 for sense data).

Table 22-2 *Invalid parameters in the SEND DIAGNOSTIC CDB*

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	1Ah	00h	1	1	0	0	0003h	Invalid Parameter List Length.
5h	24h	00h	1	1	1	—	—	A reserved bit is set in the CDB. The pointers point to the bit in error.
5h	24h	00h	1	1	1	4	0001h	Invalid Page Format field.
5h	24h	00h	1	1	1	1	0001h	Invalid value in DevOfl field.
5h	24h	00h	1	1	1	0	0001h	Invalid value in UnitOfl field.
5h	26h	00h	1	0	0	0	0000h	Invalid Page Code.

Table 22-2 *Invalid parameters in the SEND DIAGNOSTIC CDB (continued)*

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	26h	00h	1	0	0	0	0001h	Invalid Reserved byte in the Parameter List.
5h	26h	00h	1	0	0	0	0002h	Invalid Page Length.
5h	26h	02h	1	0	0	0	0004h	Invalid Test Parameter.
5h	26h	02h	1	0	0	0	0005h	Invalid Test Count.
5h	3Bh	0Eh	0	0	0	0	0000h	Source location for move is empty.
5h	53h	02h	0	0	0	0	0000h	Media removal is prevented. The requested test cannot be performed.
5h	80h	05h	0	0	0	0	0000h	The source tape drive does not exist.
5h	80h	06h	0	0	0	0	0000h	The destination tape drive does not exist.

23

SEND VOLUME TAG (B6h)

Bit Byte	7	6	5	4	3	2	1	0
00	1	0	1	1	0	1	1	0
01	Reserved				Element Type Code			
02	(MSB) Starting Element Address							
03	(LSB)							
04	Reserved							
05	Reserved			Send Action Code				
06	Reserved							
07								
08	(MSB) Parameter List Length							
09	(LSB)							
10	Reserved							
11	0	0	Reserved				0	0

23.1 About This Command

The SEND VOLUME TAG command requests that the library scan the bar code labels affixed to the cartridges and compare this volume tag information with a template sent as part of a parameter list to this command. To obtain the results of the scan performed by this command, use the REQUEST VOLUME ELEMENT ADDRESS (B5h) command.

Notes: Refer to Table 23-1 for a description of each of these errors.

- In a multi-initiator environment, you should reserve the entire library using the RESERVE (16h or 56h) command before you use the SEND VOLUME TAG command. Do not issue the RELEASE (17h or 57h) command until after you have successfully obtained data with the REQUEST VOLUME ELEMENT ADDRESS command. You should issue the commands in the following order:

  1. RESERVE (16h) for the entire library
  2. SEND VOLUME TAG (B6h)
  3. REQUEST VOLUME ELEMENT ADDRESS (B5h)
  4. RELEASE (17h)

- The library supports only the volume tag information scanned on the bar code label on the cartridges.

- The library does not allow the modification of volume tag information once it has been read from the bar code label.

- The library will not match the label of a cartridge with the Volume Identification Template Field in the Send Volume Tag Parameter List if any of the following errors occur while it is scanning the cartridge:

- Cannot read bar code label

- Tape drive not installed

- No bar code label

23.2 WHAT YOU SEND TO THE LIBRARY

Element Type Code – Byte 01, Bits 3 through 0

This field specifies the particular element types you want the library to report on. The library supports the following Element Type Codes:

0h	All element types
1h	Medium Transport Element (cartridge loader)
2h	Storage Element (cartridge cells)
3h	I/E Port Element (cartridge access port)
4h	Data Transfer Element (tape drives)

For an Element Type Code of 0h, the element types are reported in element address order, beginning with the Starting Element Address.

Starting Element Address – Byte 02 and 03

This field specifies the minimum element address at which to start the search for volume tag information that matches the template in the parameter list (see below). Only elements with addresses greater than or equal to the Starting Element Address are searched.

Note: The Starting Element Address must be 0 or a valid element address for the library, but does not have to be an address of the type requested in the Element Type Code. Only the elements of the requested element type are searched.

Send Action Code – Byte 05, Bits 4 through 0

This field defines the specific function to be performed by this command. The library supports a Send Action Code of 5h (translate, search all primary volume tags, and ignore sequence numbers).

Parameter List Length – Bytes 07 through 09

This field specifies the length of the parameter list following this command. The minimum length of the parameter list is 32 bytes (20h). The maximum length is 40 bytes (28h).

23.3 SEND VOLUME TAG PARAMETER LIST

Bit Byte	7	6	5	4	3	2	1	0
00 ... 31	Volume Identification Template Field							
32 ... 39	Reserved							

Volume Identification Template Field – Bytes 00 through 31

This field contains 32 bytes of volume identification information, which the library compares to the volume tag (bar code) information stored in nonvolatile memory. Only the first eight bytes are valid. Any additional bytes must be 0 (null). The template is considered terminated after the first 0 byte is detected. This field may contain the following characters:

? (3Fh	This character matches any single character at that position within the field.
* (2Ah)	This character is a wild card that matches any characters from that point on in that field. All characters past the "*" in the field are ignored.

Examples of valid templates are as follows:

Template	Matches
123?5678	12305678 12315678 and so on
123*5678	123___ (Any information starting with "123"; 5678 is ignored)

23.4 COMMAND STATUS

The library returns a status byte after processing the SEND VOLUME TAG command. This section describes when each type of status byte might be returned.

Good

The library returns Good status when it is able to process the command without errors.

Busy

Busy status indicates that the library is temporarily unable to accept a command from this initiator. The initiator may retry the command later.

Reservation Conflict

The library returns Reservation Conflict status when it is reserved by a different initiator. See Chapter 20 for more information about the RESERVE command.

Check Condition

The library returns Check Condition status for the following reasons:

- The command is issued to an invalid LUN.
- A Unit Attention condition is pending for the initiator.
- The library is not ready because a magazine is removed.
- A reserved bit is set to 1 in the CDB or parameter list.

- A parameter in the CDB or parameter list is invalid (see Table 23-1 for sense data).

Table 23-1 *Invalid parameters in the SEND VOLUME TAG CDB and parameter list*

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	1Ah	00h	1	1	0	0	0008h	Invalid Parameter List Length.
5h	21h	01h	1	1	0	0	0002h	Invalid Starting Element Address.
5h	24h	00h	1	1	1	—	—	A reserved bit is set in the CDB. The pointers point to the bit in error.
5h	24h	00h	1	1	1	3	0001h	Invalid Element Type Code.
5h	24h	00h	1	1	1	4	0005h	Invalid Send Action Code.
5h	26h	00h	1	0	0	0	—[a]	Invalid reserved field in parameter list.

[a] The field pointer is set to the first reserved field in the parameter list that contains a non-zero value (that is, 8, 9, 10, . . . , 38, 39).

Notes

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TEST UNIT READY (00h)

Bit Byte	7	6	5	4	3	2	1	0
00	0	0	0	0	0	0	0	0
01	Reserved							
02								
03								
04								
05	0	0	Reserved				0	0

24.1 About This Command

The TEST UNIT READY command allows the initiator to determine if the library is ready to accept all other valid commands, including motion commands. This is not a request for a library self-test, which occurs at power-on. If the library is ready to accept any valid command without returning Check Condition, Reservation Conflict, or Busy status, this command returns Good status.

24.2 Command Status

The library returns a status byte after processing the TEST UNIT READY command. This section describes when each type of status byte might be returned.

Good

The library returns Good status when it is able to process the command without errors.

Busy

Busy status indicates that the library is temporarily unable to accept a command from this initiator. The initiator may retry the command later.

Reservation Conflict

The library returns Reservation Conflict status when it is reserved by a different initiator. See Chapter 20 for more information about the RESERVE command.

Check Condition

The library returns Check Condition status for the following reasons:

- The command is issued to an invalid LUN.
- A Unit Attention condition is pending for the initiator.
- The library has experienced an unrecoverable hardware error.
- The library is not ready because a magazine is removed.
- A reserved bit is set to 1 in the CDB.
- A parameter in the CDB or parameter list is invalid (see Table 24-1 for sense data).

Table 24-1 *Invalid parameters in the TEST UNIT READY CDB and parameter list*

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
5h	24h	00h	1	1	1	—	—	A reserved bit is set in the CDB. The pointers point to the bit in error.

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WRITE BUFFER (3Bh)

Bit / Byte	7	6	5	4	3	2	1	0
00	0	0	1	1	1	0	1	1
01	Reserved					Mode		
02	Buffer ID							
03	(MSB)							
04	Buffer Offset							
05								(LSB)
06	(MSB)							
07	Parameter List Length							
08								(LSB)
09	WBF	0	Reserved				0	0

25.1 About This Command

The WRITE BUFFER allows you to load new microcode (also known as firmware) across the SCSI bus into the library's flash EEPROM. The library processes this command when it is executing the flash EEPROM code or when it is executing the ROM boot code.

Note: If new microcode becomes available, you can obtain a copy (in machine-readable form) from your vendor or download it from Tandberg Data's web site (www.tandbergdata.com).

WRITE BUFFER cannot be used to download a firmware image created by READ BUFFER.

If the initiator has less than 131,072 (020000h) bytes of buffer space available, you may want to issue more than one WRITE BUFFER command to transfer each section of the microcode.

Be sure to heed the following cautions when issuing the WRITE BUFFER command to update the microcode stored in the library's flash EEPROM.

Caution

- The WRITE BUFFER command allows you to load new microcode over the SCSI bus into the library's flash EEPROM. It is not intended to be used for testing library functionality (that is, do not issue this command unless you are actually loading new microcode).
- Do not load microcode from one model of library into another. (For example, do not load microcode from an VXA-2 1x10 PacketLoader 1U into the Magnum 224, Magnum 448, StorageLibrary T24, or StorageLoader 2U LTO or vice versa.)
- Be sure that the library is reserved for the initiator's exclusive use while the WRITE BUFFER command is executing.
- Do not power off or reset the library while this command is executing.

When the WRITE BUFFER command is used to update the microcode, the following actions occur:

1. If this was not the last or only WRITE BUFFER command, the library writes the microcode data to the buffer, returns Good status, and goes to the Bus Free phase. Then, it waits for the next WRITE BUFFER command. Otherwise, it goes to step 3.
2. When the library receives the next WRITE BUFFER command, it repeats steps 1 and 2.
3. When the data from the last or only WRITE BUFFER command has been transferred, the library disconnects from the SCSI bus.
4. The flash EEPROM is erased and reprogrammed with the new microcode. After the flash EEPROM is programmed with new microcode, part of the nonvolatile memory is erased. Because the cartridge inventory is stored in this nonvolatile memory it is erased during the reprogramming process.
5. The library reconnects to the SCSI bus and returns Good status if the command was successful.
6. A Unit Attention condition is set for all hosts. The sense data indicates that the microcode has changed.
7. The library performs its normal power-on self test and reestablishes the cartridge inventory.

25.2 WHAT YOU SEND TO THE LIBRARY

Mode – Byte 01, Bits 2 through 0

The Mode field determines the type of operation to be performed. The library performs the following operations:

010b	Write data into Read/Write buffer
100b	Write microcode to buffer but do not save it to EEPROM
101b	Write microcode to buffer and save entire buffer to EEPROM

Buffer ID – Byte 02

Valid Buffer ID values are 00h, 01h, and 02h for Mode 010b, write data to Read/Write Buffer. No distinction is made between these values. For Mode 100b or 101b, microcode download, the Buffer ID 00h should be used.

Buffer Offset – Bytes 03 through 05

The Read/Write Buffer, which is used for microcode storage, is 400100h bytes in size. The Buffer Offset, plus the Parameter List Length, should not cause this threshold to be exceeded. If it is, a CHECK CONDITION will be returned.

Parameter List Length – Bytes 06 through 08

The Read/Write Buffer, which is used for microcode storage, is 400100h bytes in size. The Buffer Offset, plus the Parameter List Length, should not cause this threshold to be exceeded. If it is, a CHECK CONDITION will be returned.

25.3 USING WRITE BUFFER TO UPDATE THE LIBRARY MICROCODE

The Read/Write Buffer, which holds the microcode being downloaded, is 400100h bytes in size. The file containing the library microcode is the same length. The file should be downloaded in whatever size pieces are convenient. The pieces of the file should be sent sequentially starting at Offset 0. Each block prior to the last should have a Mode of 100b. The Buffer ID should be 00h. The offset should represent the total of all bytes sent in previous microcode download blocks. The Parameter List Length should be the size of the block of data being sent.

The last Write Buffer, bringing the amount of data sent, up to the full 400100h bytes, should have a Mode of 101b, indicating the microcode should be programmed into the EPROM. On receipt of this block, the code will verify the validity of the microcode downloaded. If the new code is valid, a GOOD status response is sent. The tape drive will then program the EPROM and re-boot.

25.4 COMMAND STATUS

The library returns a status byte after processing the WRITE BUFFER command. This section describes when each type of status byte might be returned.

Good

The library returns Good status when it is able to process the command without errors.

Busy

Busy status indicates that the library is temporarily unable to accept a command from this initiator. The initiator may retry the command later.

Reservation Conflict

The library returns Reservation Conflict status when it is reserved by a different initiator. See Chapter 20 for more information about the RESERVE command.

Check Condition

The library returns Check Condition status for the following reasons:

- The command was issued to an invalid LUN.
- A Unit Attention condition is pending for the initiator.
- The library is unable to erase the flash EEPROM.
- The library is unable to program the flash EEPROM.
- The flash code checksum is not valid.
- A firmware update is already in progress when the WRITE BUFFER command is received.
- A reserved bit was set to 1 in the CDB.

- A parameter in the CDB is invalid (see Table 25-1 for sense data).

Table 25-1 *Invalid parameters in the WRITE BUFFER CDB and errors in programming the flash EEPROM*

Sense Key	ASC	ASCQ	SKSV Bit	C/D Bit	BPV Bit	Bit Pointer	Field Pointer	Error
4h	3Fh	80h	0	0	0	0	0000h	Flash code microcode write error: unable to erase flash EEPROM.
4h	3Fh	82h	0	0	0	0	0000h	Flash code microcode write error: unable to write zeros to flash EEPROM.
4h	3Fh	84h	0	0	0	0	0000h	Flash code microcode write error: unable to program flash EEPROM.
4h	3Fh	86h	0	0	0	0	0000h	Flash code microcode write error: bad flash code checksum.
5h	1Ah	00h	1	1	0	0	0006h	Invalid Parameter List Length.
5h	24h	00h	1	1	0	0	0001h	Invalid Mode value.
5h	24h	00h	1	1	0	0	0002h	Invalid Buffer ID value.
5h	24h	00h	1	1	0	0	0006h	Invalid Combination of Buffer Offset and Parameter List Length.

Notes

A

Error Codes

This appendix describes the errors reported by the library. The library uses two methods for reporting error conditions:

- Errors that occur only when the library is being operated from the operator panel (Sequential mode), or when the library is performing diagnostics, only appear on the LCD and are not reported by the REQUEST SENSE command.
- If the library is operating in Random mode, errors are reported over the SCSI bus. Some of these errors also appear on the LCD, others do not. Section A.2 on page A-13 describes errors reported over the SCSI bus are associated with the sense key data returned by the library in response to a REQUEST SENSE command (see Chapter 18).

A.1 Error Messages Displayed on the LCD

A.1.1 Library LCD Error Messages

This section describes the general error messages that can appear on the library's operator panel and provides corrective actions.

Caution Most library components can be replaced only by Tandberg Data-approved service providers. If you cannot find an obvious cause for the problem, contact your service provider. Do not attempt to replace any components other than the tape drive. If you do, you will void your warranty.

! Important Some corrective actions advise you to reset or power the library off and back on. To avoid disrupting communication between the host computer and other devices on the bus, make sure that there is no activity on the bus before you reset or power off the library. If you need to power the library off, first unload the cartridge from the tape drive, if possible, to avoid possible damage to the cartridge.

Table A-1 lists library LCD error messages in alphabetical order.

If the corrective action in the table:

- Refers you to the Product Manual for instructions ("See the Product Manual"), go to www.tandbergdata.com.
- Instructs you to reset the library or tape drive, go to "Resetting the library and Tape Drive" on page 3-4 for instructions.
- Does not correct the error, contact Tandberg Data Technical Support at www.tandbergdata.com or your service provider.

Table A-1 *Library LCD error messages*

Error Message	Description	Corrective Action
Auto Cleaning	The tape drive is performing an automatic cleaning of the tape drive using the cleaning cartridge in the fixed cleaning cell.	No action necessary.
Bad Cleaning Tape	The tape drive has determined that the cleaning cartridge is not the proper type for this tape drive.	Replace the cleaning cartridge with one that is compatible with this tape drive. Use only LTO cleaning cartridges with LTO tape drives.
Bad Configuration	Configuration of drives does not match drives found in library.	1. Verify that the tape drive settings in the "Drive configuration" menu match the type of drive(s) installed. See the Product Manual. 2. Check the ADI interface cabling and configuration. 3. Verify that the tape drive is operating correctly.
Bad Download	An error occurred during a firmware upload to the library. The data downloaded for the code update is incorrect.	1. Verify that you loaded the correct code. Do not load firmware from one model of library or library into another. 2. Reset the library and reload the correct firmware. If the error persists, contact Tandberg Data Technical Support or your service provider.
Bootblock	An error occurred during firmware programing of the library.	1. Verify that you loaded the correct code. Do not load firmware from one model of library or library into another. 2. Reset the library and reload the firmware. If the error persists, contact Tandberg Data Technical Support or your service provider.

Table A-1 *Library LCD error messages (continued)*

Error Message	Description	Corrective Action
Busy	The library is executing a command issued from the backup application when a command is issued from the operator panel.	Wait until the library has finished its current operation, then retry the requested operation.
Cartridge Misloaded	A cartridge was incorrectly loaded into the library.	Reload the cartridge. See the Product Manual.
Circuit Failure	The library has detected a problem within its electronic circuitry.	1. Power cycle the library. 2. If the error persists, contact Tandberg Data Technical Support or your service provider.
Command Error	The options for the command were incorrect.	1. Verify that the options for the command are valid. If they are not, correct the problem and retry the command. 2. If they appear to be correct and the error persists, contact Tandberg Data Technical Support or your service provider.
Communication	The library is unable to communicate with the tape drive.	Check the ADI interface cabling and configuration. See the Product Manual.
Create File Fail	See "File Create Fail" on page A-5	
Device Not Ready	The library is not ready to perform the requested operation because it is performing diagnostics or its power-on self-test (POST).	Wait until the library has finished, then retry the operation.
Dir Create Fail	The library could not create a new directory on the USB device.	1. Ensure that the USB device is securely inserted and retry the operation. 2. Retry with another USB device. If the error persists, contact Tandberg Data Technical Support or your service provider.
Disabled	Sequential mode is not enabled.	Sequential mode has been disabled during execution of a sequential motion. Operator may need to unload cartridges using the front panel. See "Setting the Operation Mode" on page 3-1.
Drive Command	A command issued from the library to the tape drive failed.	▪ Check the ADI interface cabling and configuration. ▪ Verify that the tape drive is operating correctly. See the Product Manual.
Drive Communication	The library is unable to communicate with the tape drive.	Check the ADI interface cabling and configuration. See the Product Manual.

Table A-1 *Library LCD error messages (continued)*

Error Message	Description	Corrective Action
Drive Empty	The command cannot be completed because the tape drive does not contain a cartridge.	Do one of the following: ▪ Load a cartridge in the tape drive and retry the operation. ▪ If there are two tape drives installed in the library, select a tape drive that contains a cartridge and retry the operation.
Drive Full	The command cannot be completed because the tape drive already contains a cartridge.	Do one of the following: ▪ Unload the data cartridge, then retry the operation. See the Product Manual. ▪ Wait until the current cartridge is unloaded by the application, then retry the operation. ▪ If the library contains two tape drives, retry the operation on the second tape drive.
Drive Incompatible	The detected tape drive is incompatible with the library.	Magnum 224, StorageLibrary T24, and StorageLoader 2U LTO libraries are only compatible with Ultrium 2 (LTO-2), Ultrium 3 (LTO-3), and Ultrium 4 (LTO-4) tape drives. Magnum 448 libraries are only compatible with Ultrium 2 (LTO-2) and Ultrium 3 (LTO-3) tape drives. Ensure that you have one of these tape drives installed in the library.
Drive Load Failed	The cartridge couldn't be loaded into the tape drive because of a mechanical problem or because of a broken tape.	1. Export the tape from the library (see the Product Manual) and verify that it is in good condition, then retry the operation. Replace the cartridge if necessary. 2. If the error persists, contact Tandberg Data Technical Support or your service provider.
Drive Timeout	The tape drive took too long to load or unload a tape, or the tape drive is not responding.	1. If possible, use the operator panel to unloaded any cartridge that is in the tape drive (see the Product Manual). 2. Power the library off and back on to reset the tape drive. 3. If the error persists, contact Tandberg Data Technical Support or your service provider.
Drive Unload Failed	The cartridge couldn't be unloaded from the tape drive because of a mechanical problem.	1. Power the library off and back on to reset the tape drive. 2. Retry the unload operation once. 3. If the error persists, contact Tandberg Data Technical Support or your service provider.
Expired Cleaning Tape	The cleaning tape in the fixed cleaning slot has been fully used.	Replace the cleaning cartridge with one that is compatible with this tape drive. Use only LTO cleaning cartridges with LTO tape drives.

Table A-1 *Library LCD error messages (continued)*

Error Message	Description	Corrective Action
Failed	Sequential mode action failed.	1. Enable Sequential mode. See "Setting the Operation Mode" on page 3-1. 2. Retry the operation. If the error persists, contact Tandberg Data Technical Support or your service provider.
File Close Fail	The library could not close the USB file.	1. Ensure that the USB device is securely inserted and retry the operation. 2. Re-write the file to the USB device and retry the operation. 3. Retry with another USB device. If the error persists, contact Tandberg Data Technical Support or your service provider.
File Create Fail	The library could not create a new file on the USB device.	1. Ensure that the USB device is securely inserted and retry the operation. 2. Re-write the file to the USB device and retry the operation. 3. Retry with another USB device. If the error persists, contact Tandberg Data Technical Support or your service provider.
File First Fail	The library could not find the first file in the USB directory.	1. Ensure that the USB device is securely inserted and retry the operation. 2. Re-write the directory to the USB device and retry the operation. 3. Retry with another USB device. If the error persists, contact Tandberg Data Technical Support or your service provider.
File Flush Fail	The library could not flush data written to the USB device.	1. Ensure that the USB device is securely inserted and retry the operation. 2. Re-write the file to the USB device and retry the operation. 3. Retry with another USB device. If the error persists, contact Tandberg Data Technical Support or your service provider.
File Next Fail	The library could not find the next file in the USB directory.	1. Ensure that the USB device is securely inserted and retry the operation. 2. Re-write the directory to the USB device and retry the operation. 3. Retry with another USB device. If the error persists, contact Tandberg Data Technical Support or your service provider.

Table A-1 *Library LCD error messages (continued)*

Error Message	Description	Corrective Action
File Open Fail	The library could not find the file on the USB device, or it could find the file, but not open it.	1. Ensure that the selected file is present on the USB device. 2. Ensure that the USB device is securely inserted and retry the operation. 3. Re-write the file to the USB device and retry the operation. 4. Retry with another USB device. If the error persists, contact Tandberg Data Technical Support or your service provider.
File Read Fail	The library could not read the next block of data from the USB device.	1. Ensure that the USB device is securely inserted and retry the operation. 2. Re-write the file to the USB device and retry the operation. 3. Retry with another USB device. If the error persists, contact Tandberg Data Technical Support or your service provider.
File Seek Fail	The library could not seek to a specific offset within a USB file.	1. Ensure that the USB device is securely inserted and retry the operation. 2. Re-write the file to the USB device and retry the operation. 3. Retry with another USB device. If the error persists, contact Tandberg Data Technical Support or your service provider.
File Write Fail	The library could not write the next block to the USB file.	1. Ensure that the USB device is securely inserted and retry the operation. 2. Retry the operation. 3. Retry with another USB device. If the error persists, contact Tandberg Data Technical Support or your service provider.
General Failure	An operation couldn't be completed because of an internal problem.	1. Reset the library and retry the operation. 2. If the error persists, contact your service provider.
General HW Failure	An operation couldn't be completed because of a mechanical problem.	1. Reset the library and retry the operation. 2. If the error persists, contact Tandberg Data Technical Support or your service provider.
I/E Port Disabled	The requested action cannot be done because the I/E port is disabled.	▪ Determine that the I/E port should be disabled and try a new command. -or- ▪ Enable the I/E port and retry the command. See the Product Manual.

Table A-1 *Library LCD error messages (continued)*

Error Message	Description	Corrective Action
I/E Port Unlocked	Import/Export element is unlocked.	Close I/E Port and retry the operation. See the Product Manual.
Invalid Cartridge	An attempt was made to load an incompatible cartridge or a spent cleaning cartridge into a tape drive and the cartridge was ejected.	▪ Remove the cartridge from the library and replace it with one that is compatible with the tape drive. See the Product Manual. ▪ If you were attempting to import a cleaning cartridge, insert a cartridge with cleaning cycles remaining on it.
Invalid Data	The library detected that the data read from the USB file is not the desired data.	1. Ensure that the correct data is in the file, re-write the file to the USB device, and retry the operation. 2. Retry with another USB device. If the error persists, contact Tandberg Data Technical Support or your service provider.
Invalid NVRAM	An operation couldn't be completed because the stored parameters are not valid.	1. Reset the library and retry the operation. 2. Use "Restore Defaults" from the Library Settings menu to refresh the library settings. 3. If the error persists, contact Tandberg Data Technical Support or your service provider.
Invalid Password	The password you entered does not match the saved password that is protecting this system.	Enter the valid password. See the Product Manual.
Magazine Unlocked	Magazine is unlocked.	Close the magazine and retry the operation. See the Product Manual.
No Cleaning Tape	The library cannot clean the tape drive since there is no cleaning cartridge in the fixed cleaning cell.	Import an LTO cleaning cartridge and then move it to the fixed cleaning cell. See the Product Manual.
No Empty Cell	The requested move cannot be completed because there is no empty cell to act as the destination for the move.	▪ Use either SCSI or front panel commands to empty a cell and retry the command. ▪ Select a different type of element as the destination.
No Empty Drive	The requested move cannot be completed because there is no empty tape drive to act as the destination for the move.	▪ Use either SCSI or front panel commands to empty a tape drive and retry the command. ▪ Select a different type of element as the destination.
No Empty I/E Port	The requested move cannot be completed because there is no empty I/E port to act as the destination for the move.	▪ Use either SCSI or front panel commands to empty an I/E Port and retry the command. ▪ Select a different type of element as the destination.

Table A-1 *Library LCD error messages (continued)*

Error Message	Description	Corrective Action
No Enabled I/E Port	The requested command cannot be completed because there is no enabled I/E port.	▪ Enable an I/E port and retry the command. -or- ▪ Select another command.
No Medium Removal	Media removal from the library has been prevented through the backup application.	▪ Turn off media removal prevention from the backup application and retry the operation. ▪ Reset the library and retry the operation.
No USB Device	The library does not see a USB device.	▪ Ensure that the USB device is securely inserted and retry. ▪ Try another USB device.
Not Calibrated	The manufacturing calibration of the library is not complete or has been compromised.	Contact Tandberg Data Technical Support or your service provider.
Not Implemented	The command is not implemented in this library.	No corrective action
Operation Aborted	The current operation was aborted by the host or user.	Retry the operation, if desired.
Operation Stopped	The current operation was stopped by the host or user.	Retry the operation, if desired.
Operator Action	You are required to intervene.	Operator intervention required: ▪ New tapes needed ▪ Correct error (see other errors in this table)
Over Temperature	The tape drive's temperature limit has been exceeded, and the cartridge has been ejected from the tape drive.	▪ Wait until the library has cooled, then unload the cartridge to a cell and re-load it into the tape drive. ▪ Check the room temperature. The ambient temperature must be no more than 40°C (104°F). ▪ Provide additional air flow around the library to improve cooling.
Owned by E-Net	The library is executing a command issued from the Remote Management utility (see the Product Manual) when a command is issued from the operator panel.	Wait until the library has finished its current operation, then retry the operation.

Table A-1 *Library LCD error messages (continued)*

Error Message	Description	Corrective Action
Owned by Panel	The library is executing a command issued from operator panel when a command is issued from the Remote Management utility (see the Product Manual).	Wait until the library has finished its current operation, then retry the operation.
Picker Ship-lock	The robot could not move because it may be locked in place by the shipping key.	Remove the shipping key (see the Product Manual).
POST Failed	The library encountered an error during its power-on self-test.	1. Reset the library and retry the operation. 2. If the error persists, contact Tandberg Data Technical Support or your service provider.
Power Fan	The library has detected that the power fan is not operating properly.	1. Power cycle the library. 2. If the error persists, contact Tandberg Data Technical Support or your service provider.
Reserve Failed	The library could not reserve the USB device resources.	1. Retry the operation. 2. Reset the library and retry the operation. If the error persists, contact Tandberg Data Technical Support or your service provider.
Reset Will Occur!	When the operation completes, the library will reset itself as if a power-cycle had occurred.	▪ If the operation has not started, proceed with the operation only if the reset will not cause a problem. ▪ If the operation is underway, no action is necessary; the machine will reset itself.
Right Cable	The library detected an error with the right-side cable.	Contact Tandberg Data Technical Support or your service provider.
Robot Empty	The robot is unexpectedly empty	1. Reset the library and retry the operation. 2. If the error persists, contact Tandberg Data Technical Support or your service provider.
Robot Full	The robot is unexpectedly full	1. Reset the library and retry the operation. 2. If the error persists, contact Tandberg Data Technical Support or your service provider.
SCSI Error	An error occurred in the ADI/SCSI interface.	Check the ADI/SCSI cabling and configuration. See the Product Manual.
SCSI Timeout	A timeout occurred in the ADI/SCSI interface.	Check the ADI/SCSI cabling and configuration. See the Product Manual.
Sequential Mode	The library is set to operate in Sequential Mode	Change to Random Mode and retry the operation. See "Setting the Operation Mode" on page 3-1.

Table A-1 *Library LCD error messages (continued)*

Error Message	Description	Corrective Action
Service Busy	The library is executing a command issued from the backup application when a command is issued from the operator panel.	Wait until the library has finished its current operation, then retry the requested operation.
Servo Failure	The library's cartridge handling mechanism (robot) has experienced a problem.	1. Reset the library and retry the operation. 2. If the error persists, contact Tandberg Data Technical Support or your service provider.
Servo Jammed	The library's cartridge handling mechanism (robot) is jammed.	1. Reset the library and retry the operation. 2. If the error persists, contact Tandberg Data Technical Support or your service provider.
Servo Timeout	The library's cartridge handling mechanism (robot) was unable to complete an operation within a specified time frame.	1. Reset the library and retry the operation. 2. If the error persists, contact Tandberg Data Technical Support or your service provider.
Servo Unsafe	The library's cartridge handling mechanism (robot) has detected an unsafe situation for the media.	1. Reset the library and retry the operation. 2. If the error persists, contact Tandberg Data Technical Support or your service provider.
Set Date Fail	The library could not set the date on a USB file or directory.	1. Ensure that the USB device is securely inserted and retry the operation. 2. Retry with another USB device. If the error persists, contact Tandberg Data Technical Support or your service provider.
Set Time Fail	The library could not set the time on a USB file or directory.	1. Ensure that the USB device is securely inserted and retry the operation. 2. Retry with another USB device. If the error persists, contact Tandberg Data Technical Support or your service provider.
Slot Empty	The command cannot be completed because the slot does not contain a cartridge.	Select a slot that has a cartridge and retry the operation.
Slot Full	The command cannot be completed because the slot already contains a cartridge.	Do one of the following: ▪ Empty the slot and retry the operation. ▪ Select a slot location that does not contain a cartridge and retry the operation.
Software Error	The library has experienced a fatal microcode error.	1. Reset the library and retry the operation. 2. If the error persists, contact Tandberg Data Technical Support or your service provider.

Table A-1 *Library LCD error messages (continued)*

Error Message	Description	Corrective Action
System Error	The library has experienced a fatal error.	1. Reset the library and retry the operation. 2. If the error persists, contact Tandberg Data Technical Support or your service provider.
System Fan	The library has detected that the system fan is not operating properly.	1. Power cycle the library. 2. If the error persists, contact Tandberg Data Technical Support or your service provider.
System Timeout	An library operation took too long.	1. Reset the library and retry the operation. 2. If the error persists, contact Tandberg Data Technical Support or your service provider.
Tape Overflow	The robot is full and no empty slot can be found.	Remove one or more cartridges. See the Product Manual.
Terminated	The operation has been stopped by the user.	Retry the operation, if desired.
Unknown Drive	The library does not recognize the tape drive.	1. Verify that the tape drive settings in the "Drive Configuration menu match the type of tape drive(s) installed. 2. Ensure that you have a valid SCSI ID set for the tape drive. See the Product Manual.

A.1.2 LIBRARY "FATAL" ERROR MESSAGES

This section describes the "fatal" error messages that can appear on the library's operator panel. If one of these errors occurs, the library goes into a halted state where only serial diagnostics communication is possible. The only recovery is to power-cycle the library: press the **0** on the back of the library (power off), then press the **I** (power on).

- Table Table A-2 lists the errors in alphabetical order.
- Fatal errors appear in the following format (see example below).

Message	Description
! Fatal Error !	Heading
<text>	This text specifies the error
<file>	The code source file which is calling out the error
<line number>	The line of code in the file which is calling out the error

! Fatal Error !

Task watchdog expired

<file><line number>

Table A-2 *Library "fatal" error messages*

Error Message	Description	Corrective Action
Attempt to Read past end of Network NVRAM area	Illegal non-volatile RAM access	1. Power-cycle the library: press the **0** on the back of the library (power off), then press the **I** (power on). 2. If the error persists, contact Tandberg Data Technical Support or your service provider.
Attempt to Write past end of Network NVRAM area	Illegal non-volatile RAM access	
BlockPoolxxxx creation failed	Unable to create data allocation pool xxxx	
Data Abort:xxxxxxx	Data accesses at illegal location	
Drive	An invalid drive ID is being used internally	
DTE_IX	An invalid drive ID is being used to select a task	
Exceeded logging source maximum	An invalid module ID is being used internally	
FIQ ints can't be enabled	Illegal use of certain interrupts	
FIQ ints can't be disabled	Illegal use of certain interrupts	
FIQ ints can't be registered	Illegal use of certain interrupts	
FIQ ints can't be unregistered	Illegal use of certain interrupts	
FIQ req [xxxxxxxx]	Illegal use of certain interrupts	
Intrpt no handler registered	Received interrupt with no firmware handler	
Invalid thread requested for launch	Attempt to start an unknown task	
Pref abort:xxxxxxx	Prefetch instruction abort occurred	
RFQx	Operating system failed reading from queue x	
Sense data too big	An internal data buffer has been made too small	
Spurious interrupt	Received invalid interrupt	

Table A-2 *Library "fatal" error messages (continued)*

Error Message	Description	Corrective Action
Spurious Interrupt during flash programming	illegal interrupt is interrupting code update	1. Power-cycle the library: press the **0** on the back of the library (power off), then press the **I** (power on). 2. If the error persists, contact Tandberg Data Technical Support or your service provider.
SW Int Expt [xxxxxxxx]	Received illegal software interrupt	
Task watchdog expired	Task failed to give up control of processor in a reasonable time	
Unable to allocate Buffer	Operating system has run out of allocatable data	
Unable to launch XXX	Unable to start operating system task XXX	
Undef Inst [xxxxxxxx]	Executed an undefined processor instruction	
Unknown [id:dd] generic interrupt	Received unknown interrupt	
WatchDog timer expired	Firmware failed report to hardware	
WTQx	Operating system failed writing to queue x	

A.2 ERRORS REPORTED OVER THE SCSI BUS

If the library is operating in Random mode, errors are reported over the SCSI bus. Some of these errors also appear on the LCD, others do not. Errors reported over the SCSI bus are associated with the sense key data returned by the library in response to a REQUEST SENSE command (see Chapter 18). These error codes include the following error information:

- The sense key (SK), Additional Sense Codes (ASCs), and Additional Sense Code Qualifiers (ASCQs) associated with the error. The ASC and ASCQ codes provide additional information for each sense key. See Table 18-1 on page 18-3 for definitions of the sense keys.
- The Tandberg Data-unique Fault Symptom Codes (FSCs). Use these codes to determine the nature of hardware and software errors and other events. The Fault Symptom Codes are defined in "Fault Symptom Code – Byte 05" on page 8-16.

This section lists the possible combinations of values for the Additional Sense Code (ASC) and the Additional Sense Code Qualifier (ASCQ) fields in the Extended Sense data returned by the REQUEST SENSE (03h) command. Each ASC and ASCQ combination is associated with one or more Sense Key values, and one or more FSCs.

For ease of reference:

- **Ascending ASC/ASCQ order**—Table A-3 lists all of the possible ASC, ASCQ, Sense Key, and FSC values returned by the library, sorted in ascending ASC/ASCQ order. Each combination of values is accompanied by one or more cause codes and one or more error recovery procedure codes (ERPs).
- **Ascending FSC order**—Table A-4 on page A-20 lists the same information as Table A-3, but it is sorted in ascending FSC order.
- **Error Recovery Procedures**—The ERPs are described in Section A.3 on page A-26.

Note: When two or more ERP codes are listed for a Fault Symptom Code, attempt the recovery procedures in the order listed.

Cause Key:			
A =	Application software	**L =**	Library
B =	Bus (SCSI)	**O =**	Operator
D =	Drive	**S =**	System
I =	Information message	**T =**	Tape

A.2.1 ERROR CODES IN ASCENDING ASC/ASCQ ORDER

Table A-3 *REQUEST SENSE error information (ASC, ASCQ, FSC, and SK)*

ASC (byte 12)	ASCQ (byte 13)	FSC	Sense Key	Cause	ERP	SCSI Error Message and Description
00h	00h	00h	0h	I	10	**No error.**
00h	06h	04h	Bh	O, B, D, A, S	11	**IO Process terminated.** SCSI data transfer aborted.
04h	01h	12h	02h	O, B, A, S	11	**Logical Unit becoming ready.**The library is not ready, but is in process of becoming ready.
04h	12h	12h	02h	S, O	8	Library has been placed offline by the system.
04h	83h	12h	02h	O	11	**Not Ready. Door open**. The cartridge access port door is open.
04h	89h	22h	02h	O	11, 2	**Not Ready. Console mode**. An application tried to issue commands to the library while it was being controlled from the Remote Management utility.

Table A-3 *REQUEST SENSE error information (ASC, ASCQ, FSC, and SK) (continued)*

ASC (byte 12)	ASCQ (byte 13)	FSC	Sense Key	Cause	ERP	SCSI Error Message and Description
04h	8Dh	21h	02h	O	11, 2	**Not Ready. Key mode**. An application tried to issue commands to the library while it was being controlled from the operator panel.
04h	8Eh	1Eh	02h	O	11, 2	**Not Ready. Sequential mode.** An application tried to issue commands to the library while it was in Sequential mode.
15h	81h	09h	4h	T, L, D	8, 14, 12,13	**Pick failure.** The cartridge loader could not pick a cartridge because of mechanical problems.
15h	83h	09h	4h	T, L, D	8, 14, 12,13	**Put failure.** The cartridge loader could not place a cartridge because of mechanical problems.
1Ah	00h	10h	5h	A	4	**Parameter length error.** The parameter list length was not valid. This error is a result of any of the following: ▪ Parameter List Length error in the MODE SELECT CDB. ▪ Illegal transfer length in CDB.
20h	00h	10h	5h	A	4	**Invalid Command OP code.** The operation code (OP code) for the CDB was invalid.
21h	01h	10h	5h	A, O	4	**Invalid element address.** There was an invalid element address specified in the CDB.
24h	00h	10h	5h	A	4	**Invalid field in CDB.** There were invalid fields in the CDB.
25h	00h	10h	5h	A, O	4	**Logical Unit not supported.** The logical unit number specified in the Identify message or in the CDB is not zero.
26h	00h	10h	5h	A, O	4	**Invalid field in parameter list.** There was an invalid field in the parameter list.
26h	02h	10h	5h	A, O	4, 15	**Parameter value invalid.** There was an invalid parameter value in the parameter list.
28h	00h	00h	6h	I	10, 11	**Not Ready to Ready. Door closed.** The library's door was opened and then closed.

Table A-3 *REQUEST SENSE error information (ASC, ASCQ, FSC, and SK) (continued)*

ASC (byte 12)	ASCQ (byte 13)	FSC	Sense Key	Cause	ERP	SCSI Error Message and Description
28h	01h	00h	06h	I	10, 11	**Not Ready to Ready.** I/E Port accessed.
29h	00h	00h	6h	I	10, 11	**Power on or reset.** A power-on, SCSI bus reset, or Target Reset message occurred.
2Ah	01h	00h	6h	I	10, 11	**Mode parameters changed.** Mode parameters have been changed. Issue a MODE SENSE (1Ah) command to determine what the new mode parameters are.
2Ah	02h	00h	6h	I	10, 11	**Log parameters changed.** Log parameters have been changed. Issue a LOG SENSE (4Dh) command to determine what the new log parameters are.
30h	00h	16h, 1Fh	3h	T, D	9, 14, 13, 12	**Incompatible medium.** (The media does not have a compatible logical format.) ▪ Incompatible media was ejected after a LOAD command was issued. ▪ Incompatible media was rejected after the data cartridge was inserted.
3Bh	15h	29h	02h	O	11	**Magazine is unlocked.** Operator may change cartridges and close magazine.
3Bh	0Dh	18h, 1Ch	5h	A, O	11, 6	**Destination full.** The destination element was occupied for a MOVE MEDIUM command. Redirect the cartridge loader to a different location.
3Bh	0Eh	19h, 1Dh	5h	A, O	11, 7	**Source empty.** The source element was empty for a MOVE MEDIUM command. Redirect the cartridge loader to a different location.
3Fh	00h	13h	6h	S, O	11	**Operating condition changed. Over temperature.** The library's internal temperature is at a unsafe level for the media. ▪ Wait until the library has cooled, then unload the cartridge to a cell and re-load it into the tape drive. ▪ Check the room temperature. The ambient temperature must be no more than 40°C (104°F). ▪ Provide additional air flow around the library to improve cooling.

Table A-3 *REQUEST SENSE error information (ASC, ASCQ, FSC, and SK) (continued)*

ASC (byte 12)	ASCQ (byte 13)	FSC	Sense Key	Cause	ERP	SCSI Error Message and Description
3Fh	01h	00h	6h	I	10	**Microcode changed.** New microcode was loaded.
3Fh	03h	00h	6h	I	10	**Inquiry data has changed.** Data in the Standard Inquiry Page has been altered. Issue an INQUIRY (12h) command to determine what the new Inquiry Data. Compare the Standard Inquiry Data Page to the The Original Data Page (Page Code C0h) to determine what changed. **Note:** Changes to the Standard Inquiry data may make it necessary to reload drivers.
3Fh	86h	15h	4h	L	8, 15, 12	**Checksum miscompare.** The flash EEPROM checksum was bad.
40h	D7h	29h	02h	O	11	**EEPort is open**.
44h	00h	05h, 06h, 07h	4h	T, L, D	8, 13, 12	**Internal target fail.** (Software error.) Firmware consistency failure.
45h	00h	08h	Bh	B, L, D, S	8, 11, 12, 13	**Select/Reselect fail.** A SCSI selection or reselection failed. The host rejected the Identify message sent by the library after the library reselected the host.
47h	00h	08h	Bh	B, L, D, S	8, 17, 11, 12, 13	**SCSI parity error.** The command was aborted because of a SCSI bus parity error.
48h	00h	08h	Bh	B, L, D, S	8, 17, 11, 12, 13	**Initiator detected error.** Operation aborted. Either the message system was disabled and the library discovered a parity error on the SCSI bus, or the message system was enabled and the initiator rejected a Restore Data Pointers message that the library sent to recover from a parity error. Or, all parity error retries were exhausted.
4Ah	00h	08h	Bh	B, L, D, S	8, 17, 11, 12, 13	**Command phase error.** A SCSI phase error occurred during the command phase.
4Bh	00h	08h	Bh	B, L, D, S	8, 17, 11, 12, 13	**Data phase error.** A SCSI phase error occurred during the data phase.

Table A-3 *REQUEST SENSE error information (ASC, ASCQ, FSC, and SK) (continued)*

ASC (byte 12)	ASCQ (byte 13)	FSC	Sense Key	Cause	ERP	SCSI Error Message and Description
4C	00	05h	02h	L, D	8, 11, 12, 13	**Logical unit failed self config.** The bootblock code is active and normal functional code cannot be started.
4Eh	00h	02h	Bh	B, L, D, S, A	8, 11, 12, 13	**Overlapped commands attempt.** Overlapped commands attempted. Bad initiator-target-LUN (ITL) nexus.
53h	00h	1Fh, 20h	03h	I	10	**Media Load/Eject fail.** Media removal prevented.
53h	02h	17h	5h	O, S, A	5, 8	**Media removal not allowed.** The library cartridge access port door cannot be opened because the operation was prevented with a PREVENT/ALLOW MEDIUM REMOVAL command.
5Bh	01h	00h	6h	I	11	**Threshold condition met.** Log threshold met. (For additional information about this error, look at the Log Parameter Page Code and Log Parameter Code bytes in the REQUEST SENSE data.)
5Bh	02h	00h	1h	I	11	**Log counter at max.** Log parameter overflow. (A cumulative counter reached its maximum value of all FFs.)
5D	FFh	00h	6h	T, L, D	11	**TapeAlert exception.** This error is a result of any of the following: ▪ An library component has exceeded its expected operational lifetime. ▪ TapeAlert asynchronous notification. ▪ TapeAlert asynchronous notification test.
5Dh	00h	00h	06h	T, L, D	11	**TapeAlert exception**. A library component has exceeded its expected operational lifetime.
83h	00h	—		T, L	14, 16, 12	**Bad label. Questionable.**The bar code label is questionable. Issue an INITIALIZE ELEMENT STATUS (07h or E7h) command to reread the label.
83h	01h	—		T, L	14, 16, 12	**Bad Label. Unreadable.** Cannot read bar code label.

Table A-3 *REQUEST SENSE error information (ASC, ASCQ, FSC, and SK) (continued)*

ASC (byte 12)	ASCQ (byte 13)	FSC	Sense Key	Cause	ERP	SCSI Error Message and Description
83h	03h	—		T, L	14, 16, 12	**Bad Label. Full Question.** Label and full status questionable. The library was powered on or the cartridge access port door was opened. The cartridge inventory may have been violated. Issue an INITIALIZE ELEMENT STATUS (07h or E7h) command to reestablish the cartridge inventory.
83h	09h	—		O, T	10, 16, 12	**Bad Label. No Label.** The bar code scanner could not read the bar code label because there was no label on the cartridge or the label was unreadable.
83h	0Ah	—		L	12	**Bad Label. Hardware Error.** The library is unable to read the bar code label due to a bar code reader hardware error.
87h	21h	1Bh	4h	D, L	8, 13, 12	**Drive comm failed.** The library is unable to communicate with the tape drive.
87h	23h	1Bh	4h	D, L	8, 13, 12	**Drive comm timeout.** The library is unable to communicate with the tape drive.
87h	24h	1Bh	4h	D, L	8, 13, 12	**Drive comm failed.** The library is unable to communicate with the tape drive.
87h	25h	12h	4h	I	8, 13, 12	**Drive not ready.** The tape drive did not return Ready status after a reset.
87h	26h	1Ah	4h	D, L	8, 13, 12	**Drive command error.** The tape drive failed to respond to a command from the library.

A.2.2 ERROR CODES IN ASCENDING FSC ORDER

Table A-4 lists the same information as Table A-3, but it is sorted in ascending FSC order.

Table A-4 *REQUEST SENSE error information (FSC, ASC, ASCQ, and SK*

FSC	ASC (byte 12)	ASCQ (byte 13)	Sense Key	Cause	ERP	SCSI Error Message and Description
—	83h	00h		T, L	14, 16, 12	**Bad label. Questionable.**The bar code label is questionable. Issue an INITIALIZE ELEMENT STATUS (07h or E7h) command to reread the label.
—	83h	01h		T, L	14, 16, 12	**Bad Label. Unreadable.** Cannot read bar code label.
—	83h	03h		T, L	14, 16, 12	**Bad Label. Full Question.** Label and full status questionable. The library was powered on or the cartridge access port door was opened. The cartridge inventory may have been violated. Issue an INITIALIZE ELEMENT STATUS (07h or E7h) command to reestablish the cartridge inventory.
—	83h	09h		O, T	10, 16, 12	**Bad Label. No Label.** The bar code scanner could not read the bar code label because there was no label on the cartridge or the label was unreadable.
—	83h	0Ah		L	12	**Bad Label. Hardware Error.** The library is unable to read the bar code label due to a bar code reader hardware error.
00h	00h	00h	0h	I	10	**No error.**
00h	28h	00h	6h	I	10, 11	**Not Ready to Ready. Door closed.** The library's door was opened and then closed.
00h	28h	01h	06h	I	10, 11	**Not Ready to Ready**. I/E Port accessed.
00h	29h	00h	6h	I	10, 11	**Power on or reset.** A power-on, SCSI bus reset, or Target Reset message occurred.
00h	2Ah	01h	6h	I	10, 11	**Mode parameters changed.** Mode parameters have been changed. Issue a MODE SENSE (1Ah) command to determine what the new mode parameters are.

Table A-4 *REQUEST SENSE error information (FSC, ASC, ASCQ, and SK (continued)*

FSC	ASC (byte 12)	ASCQ (byte 13)	Sense Key	Cause	ERP	SCSI Error Message and Description
00h	2Ah	02h	6h	I	10, 11	**Log parameters changed.** Log parameters have been changed. Issue a LOG SENSE (4Dh) command to determine what the new log parameters are.
00h	3Fh	01h	6h	I	10	**Microcode changed.** New microcode was loaded.
00h	3Fh	03h	6h	I	10	**Inquiry data has changed.** Data in the Standard Inquiry Page has been altered. Issue an INQUIRY (12h) command to determine what the new Inquiry Data. Compare the Standard Inquiry Data Page to the The Original Data Page (Page Code C0h) to determine what changed. **Note:** Changes to the Standard Inquiry data may make it necessary to reload drivers.
00h	5Bh	01h	6h	I	11	**Threshold condition met.** Log threshold met. (For additional information about this error, look at the Log Parameter Page Code and Log Parameter Code bytes in the REQUEST SENSE data.)
00h	5Bh	02h	1h	I	11	**Log counter at max.** Log parameter overflow. (A cumulative counter reached its maximum value of all FFs.)
00h	5D	FFh	6h	T, L, D	11	**TapeAlert exception.** This error is a result of any of the following: ▪ An library component has exceeded its expected operational lifetime. ▪ TapeAlert asynchronous notification. ▪ TapeAlert asynchronous notification test.
00h	5Dh	00h	06h	T, L, D	11	**TapeAlert exception.** A library component has exceeded its expected operational lifetime.
02h	4Eh	00h	Bh	B, L, D, S, A	8, 11, 12, 13	**Overlapped commands attempt.** Overlapped commands attempted. Bad initiator-target-LUN (ITL) nexus.
04h	00h	06h	Bh	O, B, D, A, S	11	**IO Process terminated.** SCSI data transfer aborted.

Table A-4 *REQUEST SENSE error information (FSC, ASC, ASCQ, and SK (continued)*

FSC	ASC (byte 12)	ASCQ (byte 13)	Sense Key	Cause	ERP	SCSI Error Message and Description
05h	44h	00h	4h	T, L, D	8, 13, 12	**Internal target fail.** (Software error.) Firmware consistency failure.
05h	4C	00	02h	L, D	8, 11, 12, 13	**Logical unit failed self config.** The bootblock code is active and normal functional code cannot be started.
06h	44h	00h	4h	T, L, D	8, 13, 12	**Internal target fail.** (Software error.) Firmware consistency failure.
07h	44h	00h	4h	T, L, D	8, 13, 12	**Internal target fail.** (Software error.) Firmware consistency failure.
08h	45h	00h	Bh	B, L, D, S	8, 11, 12, 13	**Select/Reselect fail.** A SCSI selection or reselection failed. The host rejected the Identify message sent by the library after the library reselected the host.
08h	47h	00h	Bh	B, L, D, S	8, 17, 11, 12, 13	**SCSI parity error.** The command was aborted because of a SCSI bus parity error.
08h	48h	00h	Bh	B, L, D, S	8, 17, 11, 12, 13	**Initiator detected error.** Operation aborted. Either the message system was disabled and the library discovered a parity error on the SCSI bus, or the message system was enabled and the initiator rejected a Restore Data Pointers message that the library sent to recover from a parity error. Or, all parity error retries were exhausted.
08h	4Ah	00h	Bh	B, L, D, S	8, 17, 11, 12, 13	**Command phase error.** A SCSI phase error occurred during the command phase.
08h	4Bh	00h	Bh	B, L, D, S	8, 17, 11, 12, 13	**Data phase error.** A SCSI phase error occurred during the data phase.
09h	15h	81h	4h	T, L, D	8, 14, 12,13	**Pick failure.** The cartridge loader could not pick a cartridge because of mechanical problems.
09h	15h	83h	4h	T, L, D	8, 14, 12,13	**Put failure.** The cartridge loader could not place a cartridge because of mechanical problems.

Table A-4 *REQUEST SENSE error information (FSC, ASC, ASCQ, and SK (continued)*

FSC	ASC (byte 12)	ASCQ (byte 13)	Sense Key	Cause	ERP	SCSI Error Message and Description
10h	1Ah	00h	5h	A	4	**Parameter length error.** The parameter list length was not valid. This error is a result of any of the following: ▪ Parameter List Length error in the MODE SELECT CDB. ▪ Illegal transfer length in CDB.
10h	20h	00h	5h	A	4	**Invalid Command OP code.** The operation code (OP code) for the CDB was invalid.
10h	21h	01h	5h	A, O	4	**Invalid element address.** There was an invalid element address specified in the CDB.
10h	24h	00h	5h	A	4	**Invalid field in CDB.** There were invalid fields in the CDB.
10h	25h	00h	5h	A, O	4	**Logical Unit not supported.** The logical unit number specified in the Identify message or in the CDB is not zero.
10h	26h	00h	5h	A, O	4	**Invalid field in parameter list.** There was an invalid field in the parameter list.
10h	26h	02h	5h	A, O	4, 15	**Parameter value invalid.** There was an invalid parameter value in the parameter list.
12h	04h	01h	02h	O, B, A, S	11	**Logical Unit becoming ready.**The library is not ready, but is in process of becoming ready.
12h	04h	12h	02h	S, O	8	Library has been placed offline by system.
12h	04h	83h	02h	O	11	**Not Ready. Door open**. The cartridge access port door is open.
12h	87h	25h	4h	I	8, 13, 12	**Drive not ready.** The tape drive did not return Ready status after a reset.

Table A-4 *REQUEST SENSE error information (FSC, ASC, ASCQ, and SK (continued)*

FSC	ASC (byte 12)	ASCQ (byte 13)	Sense Key	Cause	ERP	SCSI Error Message and Description
13h	3Fh	00h	6h	S, O	11	**Operating condition changed. Over temperature.** The library's internal temperature is at a unsafe level for the media. ▪ Wait until the library has cooled, then unload the cartridge to a cell and re-load it into the tape drive. ▪ Check the room temperature. The ambient temperature must be no more than 40°C (104°F). ▪ Provide additional air flow around the library to improve cooling.
15h	3Fh	86h	4h	L	8, 15, 12	**Checksum miscompare.** The flash EEPROM checksum was bad.
16h	30h	00h	3h	T, D	9, 14, 13, 12	**Incompatible medium.** (The media does not have a compatible logical format.) ▪ Incompatible media was ejected after a LOAD command was issued. ▪ Incompatible media was rejected after the data cartridge was inserted.
17h	53h	02h	5h	O, S, A	5, 8	**Media removal not allowed.** The library cartridge access port door cannot be opened because the operation was prevented with a PREVENT/ALLOW MEDIUM REMOVAL command.
18h	3Bh	0Dh	5h	A, O	11, 6	**Destination full.** The destination element was occupied for a MOVE MEDIUM command. Redirect the cartridge loader to a different location.
19h	3Bh	0Eh	5h	A, O	11, 7	**Source empty.** The source element was empty for a MOVE MEDIUM command. Redirect the cartridge loader to a different location.
1Ah	87h	26h	4h	D, L	8, 13, 12	**Drive command error.** The tape drive failed to respond to a command from the library.
1Bh	87h	21h	4h	D, L	8, 13, 12	**Drive comm failed.** The library is unable to communicate with the tape drive.
1Bh	87h	23h	4h	D, L	8, 13, 12	**Drive comm timeout.** The library is unable to communicate with the tape drive.

Table A-4 *REQUEST SENSE error information (FSC, ASC, ASCQ, and SK (continued)*

FSC	ASC (byte 12)	ASCQ (byte 13)	Sense Key	Cause	ERP	SCSI Error Message and Description
1Bh	87h	24h	4h	D, L	8, 13, 12	**Drive comm failed.** The library is unable to communicate with the tape drive.
1Ch	3Bh	0Dh	5h	A, O	11, 6	**Destination full.** The destination element was occupied for a MOVE MEDIUM command. Redirect the cartridge loader to a different location.
1Dh	3Bh	0Eh	5h	A, O	11, 7	**Source empty.** The source element was empty for a MOVE MEDIUM command. Redirect the cartridge loader to a different location.
1Eh	04h	8Eh	02h	O	11, 2	**Not Ready. Sequential mode.** An application tried to issue commands to the library while it was in Sequential mode.
1Fh	30h	00h	3h	T, D	9, 14, 13, 12	**Incompatible medium.** (The media does not have a compatible logical format.) ▪ Incompatible media was ejected after a LOAD command was issued. ▪ Incompatible media was rejected after the data cartridge was inserted.
1Fh	53h	00h	03h	I	10	**Media Load/Eject fail.** Media removal prevented.
20h	53h	00h	03h	I	10	**Media Load/Eject fail.** Media removal prevented.
21h	04h	8Dh	02h	O	11, 2	**Not Ready. Key mode**. An application tried to issue commands to the library while it was being controlled from the operator panel.
22h	04h	89h	02h	O	11, 2	**Not Ready. Console mode**. An application tried to issue commands to the library while it was being controlled from the Remote Management utility.
29h	3Bh	15h	02h	O	11	**Magazine is unlocked.** Operator may change cartridges and close magazine.
29h	40h	D7h	02h	O	11	EEPort is open.

A.3 ERROR RECOVERY PROCEDURES

The following table describes the error recovery procedures (ERPs) recommended for each Fault Symptom Code listed in the previous section.

Caution Some recovery procedures advise you to reset the tape drive. Before performing a reset, make sure there is no SCSI activity on the SCSI bus to which the drive is connected. Resetting a device on an active bus may disrupt communications.

Table A-5 *Recommended error recovery procedures*

ERP	Recommended error recovery procedure
1	Press any key on the operator panel to close the door.
2	Set the library to Random mode (see "Setting the Operation Mode" on page 3-1).
3	Reissue the failed command or command sequence.
4	Correct the errors in the CDB bytes, parameter data, or Logical Unit Selection.
5	Issue a PREVENT/ALLOW MEDIUM REMOVAL command to allow medium removal.
6	Remove the cartridge from the destination or redirect the cartridge loader to another location.
7	Install a cartridge in the source location or redirect the cartridge loader to another location.
8	Make sure the library and tape drive are not being used by any host, then perform one of the following actions to reset the library: ▪ Reset the library or tape drive from the operator panel (see "Resetting the library and Tape Drive" on page 3-4). ▪ Power the library off and back on again. ▪ Send a SCSI bus reset ("hard" reset). If the error persists, contact your service provider.
9	Clean the tape drive and repeat the operation.
10	No action is necessary.
11	User should determine what recovery procedure to follow.
12	The library requires maintenance. Contact your service provider.
13	The tape drive requires maintenance. Contact your service provider.
14	Repeat the operation with a different data cartridge.
15	Reload firmware.
16	Replace the bar code label. Refer to the individual Product Manuals for information about placing the labels on the cartridges. For specifications for the bar code labels that can be used with the library, refer to the *Tandberg Data Bar Code Specification for LTO Ultrium Cartridges*.
17	Check the SCSI cables and terminator. Replace if damaged.

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